THE MARINE REVIEW

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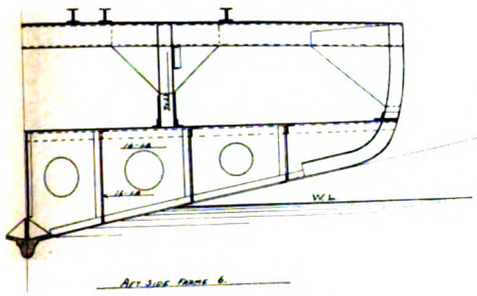
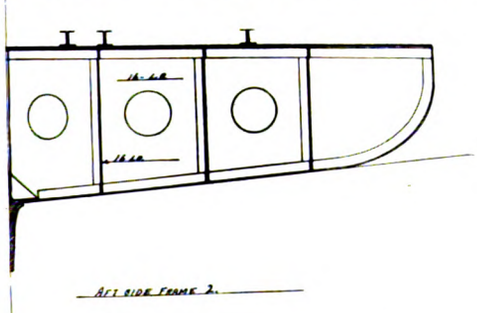
CAR FERRY FOR ST. LAWRENCE RIVER.

Contract has been awarded to the Polson Iron Works, Toronto, Ont., by the Canadian Pacific Car & Passenger

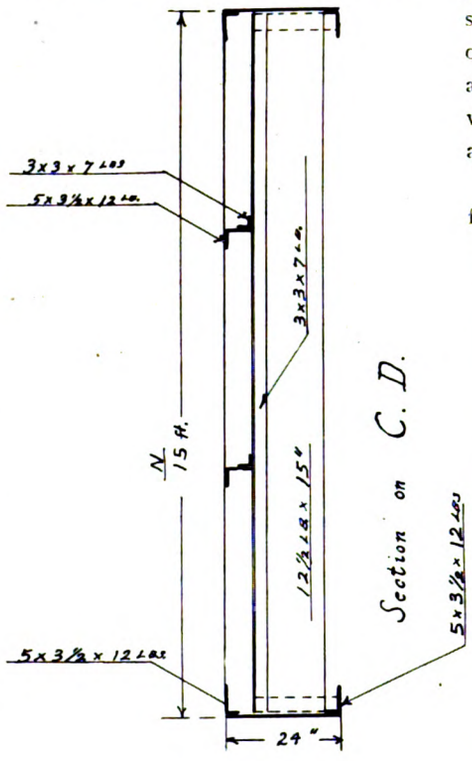


Transfer Co., Prescott, Ont., for the construction of an ice-breaking car and passenger transfer steamer designed by M. C. Furstenau, naval architect, 308 Walnut



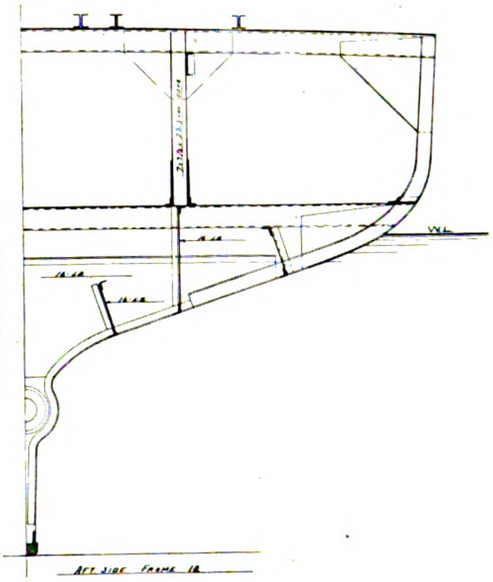
street, Philadelphia, under whose supervision it will be built. This steamer is to be finished and delivered by Oct. 2, 1907, and is intended for service in the St. Lawrence river, between Ogdensburg, N. Y., and Prescott, Ont.

The principal dimensions of the steamer are: Length over all, 280 ft.; breadth molded, 40 ft.; depth molded at center, 22 ft.; depth molded at ends, 18 ft. 6 in. Draught when fully loaded with ten cars, 12 ft. The machinery installation will consist of two compound engines, having cylinders 22 in. and 44 in. by 30 in. stroke, operating under a steam pressure of 130 lbs. at 125 revolutions. The engines are to develop 1,000 H. P. each. All parts of the engines are made extra strong, in order to allow for the severe



shocks and strains to which it will be subjected, when working in the ice, which at times forms to a thickness of 30 inches. The shafting is made entirely of open-hearth forged steel. The crank and thrust shaft are 10½ in. in diameter, the propeller shaft is 11 in. diameter. Each shaft is fitted with one propeller, made of the Penn Steel Casting Co.'s special annealed open-hearth steel. The wheels will be each 9 ft. 6 in. in diameter with a pitch of 12 ft.

The boiler installation will consist of four single-ended Scotch type boilers,



built for a working pressure of 130 lbs. per square inch. The boilers will be arranged to operate under Howden's system of forced draft. The forced draft equipment will be of sufficient capacity to burn, at least, 5,040 lbs. of coal per hour, and maintain a ½ in. air pressure in the ash pits of the boilers. A complete ballast system will be installed so that the steamer can be trimmed by the head or stern 6 in. in about three minutes. A complete electric light system of 15 K. W. will also be installed.

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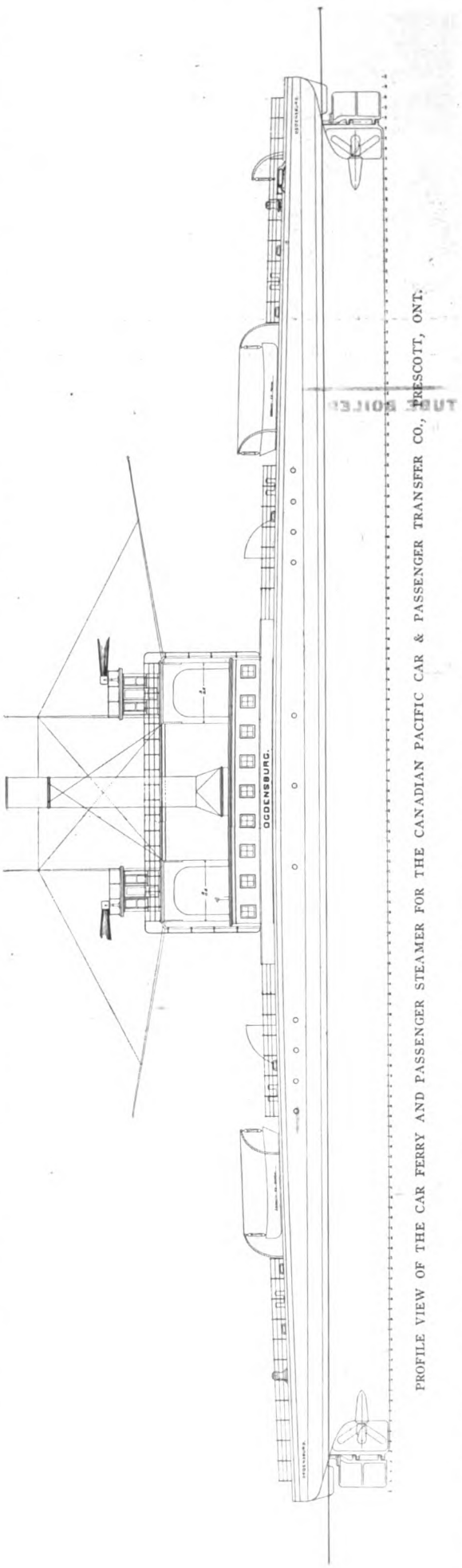
The hull will be built of ample strength, so as to be able to withstand heavy charging into the ice. The stem and stern posts will be of steel castings, so arranged that the shell plating will be fastened to them with only single-ply riveting. All plating will be treble riveted to the stem and stern posts. The stem and stern posts will be cast with a central flange, so that the ramming plate can be riveted to this. This ramming plate is built up intercostal with the floors back to the trimming tank bulkheads. The arrangement of the framing and plating at the forward and after ends is such that the shock due to striking ice is transmitted over a large area of the ship's framing. The frames are generally spaced 24 in. centers, and consist of 7 in. by 3½ in. by 21 lb. channels. At the forward and after ends half frames are interposed between the regular frames which makes the frame spacing only 12 in. at the ends. The shell is fitted with an ice belt which extends 40 in. below the load water line and 20 in. above the load water line; this ice belt will be of 30 lb. plate throughout. All vertical butts of the shell plating will be single, butt strapped and treble riveted. Three lines of standard car rails will be fitted to the deck.

Passenger accommodations will be arranged for 100 passengers. The steamer will probaby be named Charles Lyon in honor of the father of David H. Lyon, of Ogdensburg, president of the Canadian Pacific Car & Passenger Transfer Co. Mr. Charles Lyon first inaugurated a ferry line between the ports of Ogdensburg and Prescott.



PROFILE VIEW OF THE CAR FERRY AND PASSENGER STEAMER FOR THE CANADIAN PACIFIC CAR & PASSENGER TRANSFER CO., PRESCOTT, ONT.

TAIL SHAFTS AND LUBRICATORS.

A naval architect, writing to the *Shipping Gazette*, London, on the alleged growing practice of running tail shafts in oil, says:

"The tail shaft has always been one of the tender spots in a steamer. It carries the propeller; hence, its importance. When large steamers began to go to sea in ballast, and broken tail shafts became very numerous, investigations were naturally made into the efficacy of various methods of lubrication. The original idea of fitting a lignum vitæ bush in the stern tube, and a brass sleeve in the shaft in way of the lignum vitæ, allowing the sea water to form an unguent, was called in question. It had worked well and it was simple; but it was found that there was a tendency for the shaft to corrode and develop flare at the ends of the brass liners. The brass liners in better class boats were fitted the whole length of the shaft. This was expensive, and methods of lubricating the bearing with oil were tried. Ordinary stuffing boxes, glands, etc., were fitted on the shaft to exclude the sea water, and oil was allowed to get into the bearing from a tank near the upper deck, the head of oil preventing any leakage of water inwards. This method of dealing with the trouble has met wth some success, but obviously there must be difficulty, not easily overcome, of adjusting the gland, to allow for the inevitable wear of the stern bush. Since the board of trade and the registration societies increased the size of tail shafts there has been much less trouble, and the necessity for mechanical methods of lubrication has diminished. There are, of course, methods of lubrication still in force with moderately successful results. For them, claims of economy are made, but qualitative results of this kind are inconclusive, as the friction is necessarily a small part of the total. As a means of lengthening the life of the tail shaft the value of the practice is problematical. On ships of the royal navy, on liners, and on the better class of cargo steamers a brass sleeve is fitted the whole length of the shaft, with lignum vitæ, as in the old arrangement."

Capt. Hiram M. Brown died at Detroit recently. He began sailing when sixteen years of age on the schooner Fashion. In 1861 he was part owner and master of the Wm. H. Hinsdlae. When the civil war broke out he served on one of the Federal transports on the Mississippi river. At the close of the war he became a contractor. Returning later to Detroit, the firm of Scott & Brown was formed. This partnership was dissolved in 1878 and Capt. Brown entered the hotel business. Later he took up the vessel business again, his last connection being with the Cleveland & Port Stanley line.

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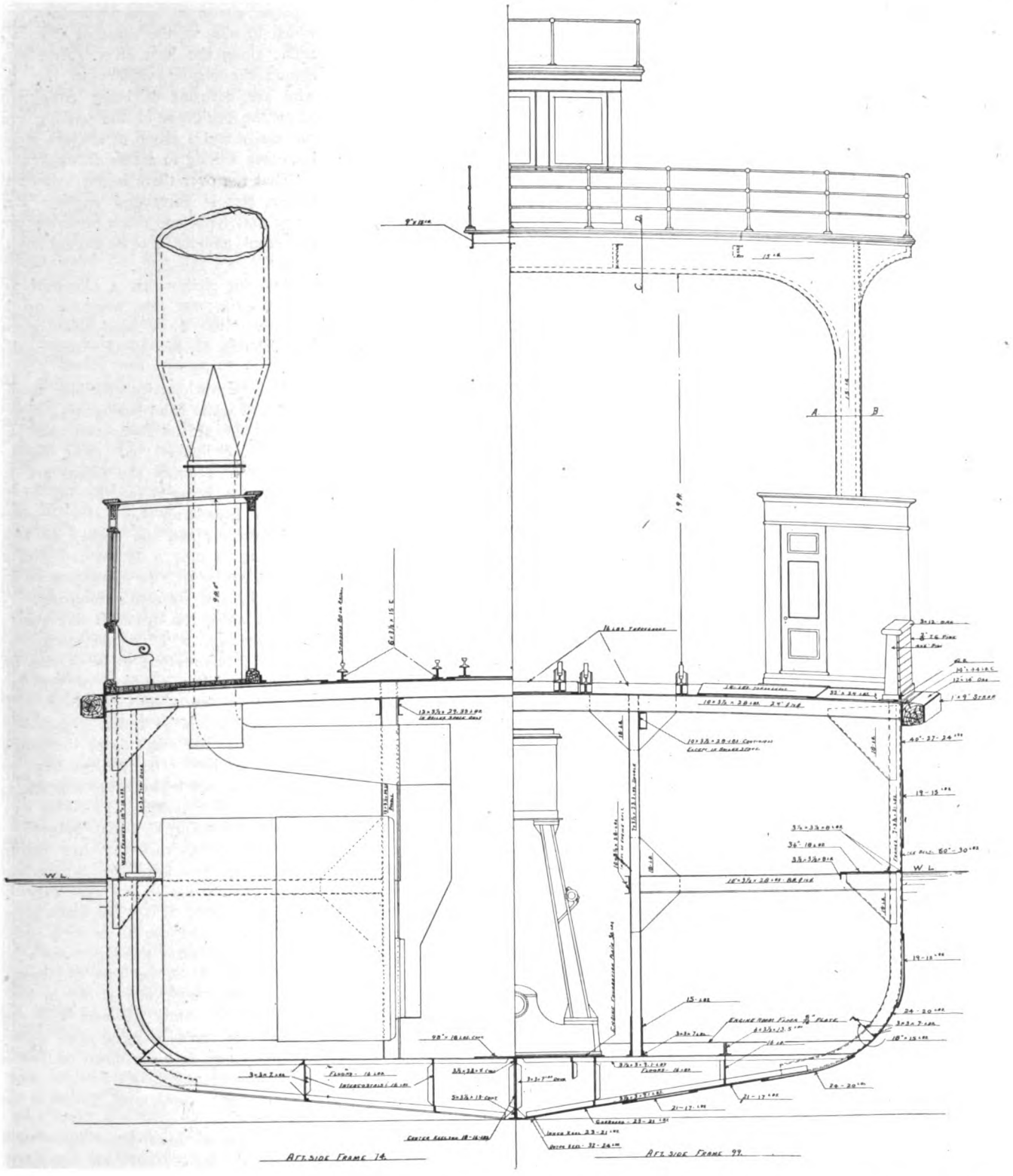

MIDSHIP SECTION OF THE CAR FERRY AND PASSENGER STEAMER FOR THE CANADIAN PACIFIC CAR & PASSENGER TRANSFER CO., PRESCOTT, ONT.

SEEN AND HEARD IN THE ENGINE ROOM.

A harbor tug was tied up at Pier 3, East river, and her old engineer, seated upon the stringpiece, gave his opinion of matters nautical as well as mechanical to a crowd of loungers.

"Electricity is a queer thing, or a juice, or a something of which we know very little as yet. Just imagine that I pile some gunpowder around that piece of iron"—indicating a stud from an old anchor chain that was lying on the dock. "I'll then start my dynamo, turn on the juice, and bring the light I use for prospecting around my engine over on the dock—it will reach till about here. I smash the globe against the stud and—you think there is going to be an explosion of gunpowder?"

"But do not worry; the breaking of the globe causes the light to go out so suddenly that there is not the slightest chance of an ignition of the powder."

While the ancient sage on the stringpiece was thus holding forth an unusual undertaking was decided upon on board one of the largest wrecking tugs in New York harbor.

The fresh water tank had just been

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cleaned, and to prevent the water from rusting the iron it was deemed fit to paint the tank's interior with what is nautically termed "explosive" paint. The trade name is, I believe, "Adamant," or "Adamantine" paint. Anyhow this paint effectively keeps the water from the iron, but to apply it in a confined space is rather hard on the painter, on account of the fumes that ever arise from it. But the tank in question, as said before, was installed on a wrecking tug, diving suits were ready to hand, a painter was speedily dressed in one of them, provided with a pot of paint, a brush and an electric lamp and lowered through the manhole into the tank. The fumes in the tank became stifling, but the painter, receiving his supply of oxygen through the tube at the back of his helmet, was not inconvenienced.

When the work was done men were ready to pull forth the painter. The upper part of his body was above the manhole, when the electric lamp, which he had fastened to his waist, came in contact with the iron and broke.

According to the old engineer mentioned above, there was no danger to be apprehended.

But the fact remains that the contents of the diving suit—the painter—has been for several months in the hospital as a result of the explosion that followed, and was engendered by, the breaking of the electric lamp.

When engineers "blow off" a boiler they desire to allow it to cool before opening manholes.

The boiler of the tug Mabel had been "blown off"; had cooled off for several hours, and a fireman and an engineer went through the manhole—the former to clean, the latter to inspect. After his tour of inspection, and preparatory to returning to civilization, the engineer instructed the fireman to wipe the interior of the boiler with kerosene. This was done, the manhole cover replaced and then the engineer remembered to have left his hammer inside.

But instead of again removing the cover, it was thought that the hammer must have dropped down in one of the "legs" (it being a water-tube boiler), in which case, by removing one of the small covers at that part of the boiler, the hammer could easily be reached.

Let it now be remembered that the plates were still rather hot, that the boiler had been wiped with kerosene and that the manhole cover was in place. Removing the cover from the small hole in the "leg," and then introducing his oil lamp in order to locate the hammer, the fireman was blown against the bulkhead by the explosion of the gases from the kerosene that had been applied to hot plates.

For several months a steam lighter had been undergoing repairs at one of the yards along the Jersey shore. In her engine room a gang of men from that asbestos concern in South Brooklyn were hard at work covering steam pipes—first a little cement, then the thick layer of asbestos and over all the neat canvas covering with the ornamental brass straps.

Enter the chief with the admonition to the shore gang: "Do not forget to cover the exhaust pipe."

Of course, these men had covered exhaust pipes before. Often the steam used in the main engine is made use of to drive smaller machines. Also in the case of low pressure engines it may be found that the condenser produces too cold water for the feed pump, and then the covering of the exhaust pipe may be advisable. But the lighter here referred to had a high-pressure engine, and the foreman of the asbestos workers expressed his wonder at the chief's solicitude for the state of the steam after it had done its work.

It was then the chief explained that the covering muffled the noise of the exhaust, "and a good engineer"—here he drew himself proudly erect—"depends on his ears to diagnose the complaints of his charge."

"Either my nose or my eyes may warn me that a bearing is overheated, but my ears must apprise me of anything else that can arise."

An engineer whose youthful appearance was hardly conducive to impressing prospective employers with his experience in his chosen vocation, applied for a position on a ferryboat. "Ever handled a beam engine?"

"No, sir."

"Could you point out a difference, or a distinction, between a crankshaft of a beam engine and one of some other type?"

Here is the answer he gave: "When a beam engine is used to turn sidewheels with 'fixed' buckets; that is, if bearings are placed outside of the wheels, there may, or there may not, be a difference. In the case of 'feathering' wheels, no bearings are placed outside of the wheel, and to prevent the possible breaking of the shaft the crankpin is 'fixed' only at one side and 'keyed' at the other side of the crank."

The young man is now answering the bells that are "pulled" in the pilot house of a ferryboat.

The recreation pier at the foot of Market street is an excellent place for a casual visitor in New York City from which to observe the constant stream of traffic along the East river. And those among the chance visitors to this pier who are desirous of being enlightened as to the pedigrees of the passing craft can easily find a group of ancient steamboat men willing to act as demonstrators.

"That tug over there is the Tracy; she has a steeple compound engine; don't fancy that type; too much pressure upon one crank and liable to be caught on the center.

"The big fellow is a Pennsylvania Railroad tug; see that 'keystone' on her stack, and the white band below shows she belongs to the Perth Amboy division.

"And the towboat with the blue smokestack and white band belongs to a Swede called Johnson; he owns two tugs and a score of lighters; all those lighters with the blue masts and booms are his.

"There is a tug flying the flag of the Munson Steamship Co. Her engineer is the owner, and the display of Munson's flag is only a bit of taffy in acknowledgment of the employment furnished by the steamship company.

"Over along the Brooklyn side are two tugs each with a 'D' on the stack. The red 'D' proclaims one to be of the Dalzell fleet. They do most of the large steamboats' work—docking them. The other tug is one of Dailey's, showing a white 'D' at the very top of the stack—that's the John D. Dailey—her condenser is placed between the seacock and the circulation pump. Did you ever hear of anything like that before? A circulation pump sucking water through the tubes; there have been times when her condenser got so hot that they had to play the hose on it. The black steamer 'skinning' the docks, as it is called, belongs to the city; the supervisor's boat—buff stack, black top and 'eye burgee.'

"It is now 'highwater slack,' and that tug showing a white 'M' on a black stack—one of Moran's—is going after a couple of mud scows to bring down on the ebb tide; twenty-four hour watches and a double crew; workhouses, but they feed well.

"The steam canaler over there has a surface condenser, but no circulation pump.

"How do they manage?

"If she has to buck a strong head tide they do not expect to manage. You see, a pipe leads from a hole in the bow to the condenser, and then another pipe from the condenser to a hole at the stern; if she makes fair headway the water rushes pretty steadily through the tubes—otherwise, well, some day the owner may invest in a pump.

"That white yacht is going to the Twenty-third street anchorage; the flag

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at the fore—the one with the small star—tells that she is enrolled in the New York Yacht club; the flag at the main truck is the owner's private signal and that square blue flag half way down the mast—the absent flag—means that the owner is not on board.

"All those yachts discharge their circulation water below the surface; looks better and the passengers won't get a ducking when coming alongside.

"But, then, the condenser is always full of water and salt water—the owners are rich."

Observant citizens visiting the Battery must have noticed the procession of scows, loaded with refuse or mud, that are daily being towed seaward at the beginning of an ebb tide, or that are returning empty during the latter part of a flood tide. The tugs engaged in this work are hired by the city, and as only the better, the larger and the stronger tugs are fit for mud scow towing the monthly bills fairly stagger the taxpayers—if not humanity.

Some years ago the city of New York decided to own and operate its own fleet, and, acting upon this decision, there was launched the combination steamer and dumping scow Cinderella. The best way to describe this craft is to state that two "whaleback" steamers have been placed side by side—ten feet apart. In the space between these "whalebacks" the receptacle for the mud has been built.

The description is, then, two whaleback steamers riveted on either side of a long, iron box provided with a movable bottom. The port whaleback contains a boiler, a horizontal compound engine and a dynamo.

The sister whaleback joined to the starboard side of the garbage box, also has a boiler, a compound engine, but instead of a dynamo (one being sufficient for the twins), she is provided with machinery for hoisting the bottom in place after the freight has been consigned to the deep.

As for the question: "Is the Cinderella a failure?"

She looks a wreck; has now for some months been tied up at the foot of Sixth street and enabled two high-priced engineers and a fireman to draw their pay from the city in exchange for a daily visit to the subject of this sketch.

Seated upon the forward rail of a small tug was a fireman reading a dime novel.

He was not addicted to this form of recreation, but the title of the novel—"The Pirates of New York Bay"—had caused him to invest. He had been carefully perusing a few pages of the book when the following sentence made him declare that the writer could not have been much of a steamboat man: "Jersey Mike boarded the abandoned tug, opened the seacock and then had barely time to row away before the craft sank below the waves."

Here is the fireman's comment:

"If Jersey Mike was a greenhorn he could not speedily locate the seacock. And if he knew the ropes he must have been aware that the seacock of a New York tug is always connected with a pump. Simply opening the seacock could not have harmed the tug; it would take him an hour to get a tug in a proper condition for sinking—unless he had sense enough to cut a pipe."

But—"he opened the seacock'—I'll read no further about Jersey Mike."

F. H.

DIRECTION INDICATOR.

J. W. Ray & Co., Liverpool, are introducing through Frank Watkins Jr., River street, Cleveland, an automatic engine direction indicator on the great lakes. This gear indicates automatically on the bridge the direction of the rotation of the engines.

This indication is effected either on an extra third dial on the ordinary telegraph or where a vessel is already fitted with ordinary telegraphs, it may be placed on a separate stand. It consists of an arrangement of wheels, with an initially compressed spiral spring, which is bolted on column of main engines and attached to the reversing gear, (see drawing) but it is so arranged as not to transmit any movement of the same *until the engines actually move.*

This is effected by the first stroke of the crosshead releasing a lever, in connection with the gear on column, and allowing the spring to transmit to the bridge the then actual direction of rotation of engines. This movement placing the lever out of connection with the crosshead until a change of the direction of rotation of engines takes place, when it is at once brought into a position to enable it to indicate the next movement or stoppage of the engines.

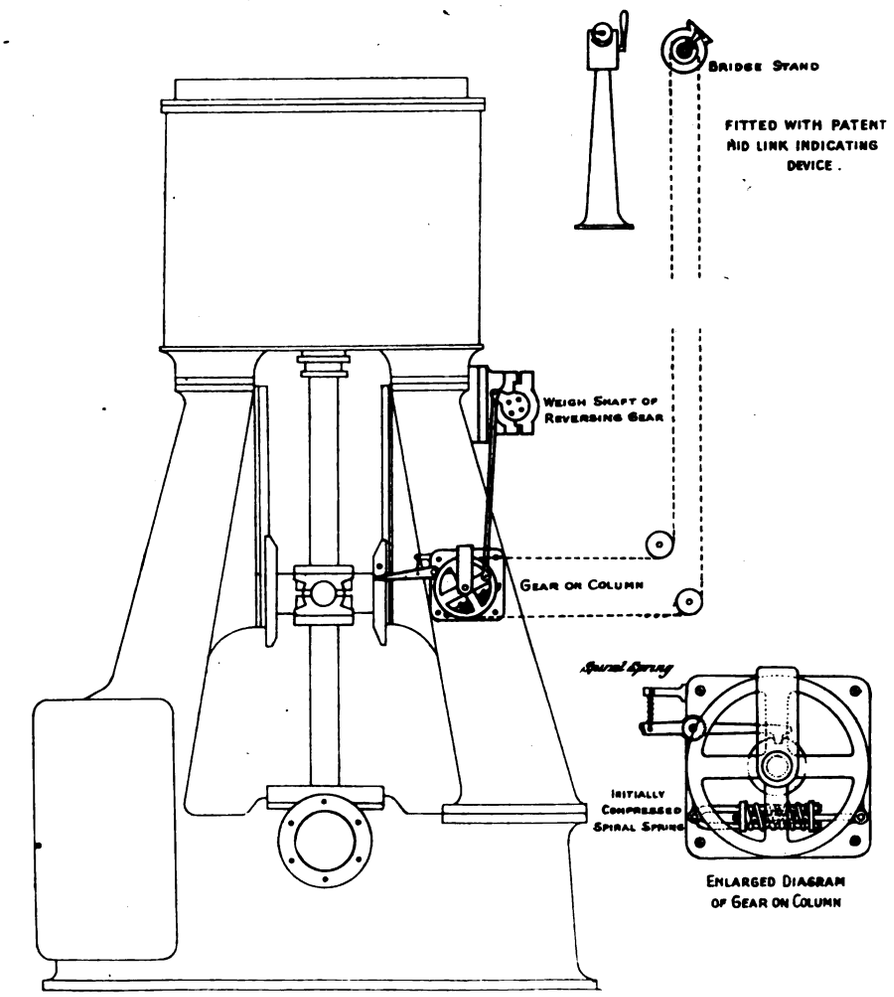
BRIDGE STAND
FITTED WITH PATENT MID LINK INDICATING DEVICE.
WEIGH SHAFT OF REVERSING GEAR
GEAR ON COLUMN
Spiral Spring
INITIALLY COMPRESSED SPIRAL SPRING
ENLARGED DIAGRAM OF GEAR ON COLUMN

DIAGRAM OF THE DIRECTION INDICATOR.

James Brown & Son, 52-56 Darnley street, Glasgow, Scotland, have just put on the market a form of log for turbine steamers entitled "Brown's Parsons Turbine Engineer's Log." The diagram is very complete and the form must be of material advantage to the engineer of a turbine vessel. The size of the sheet is 11 by 13 in.

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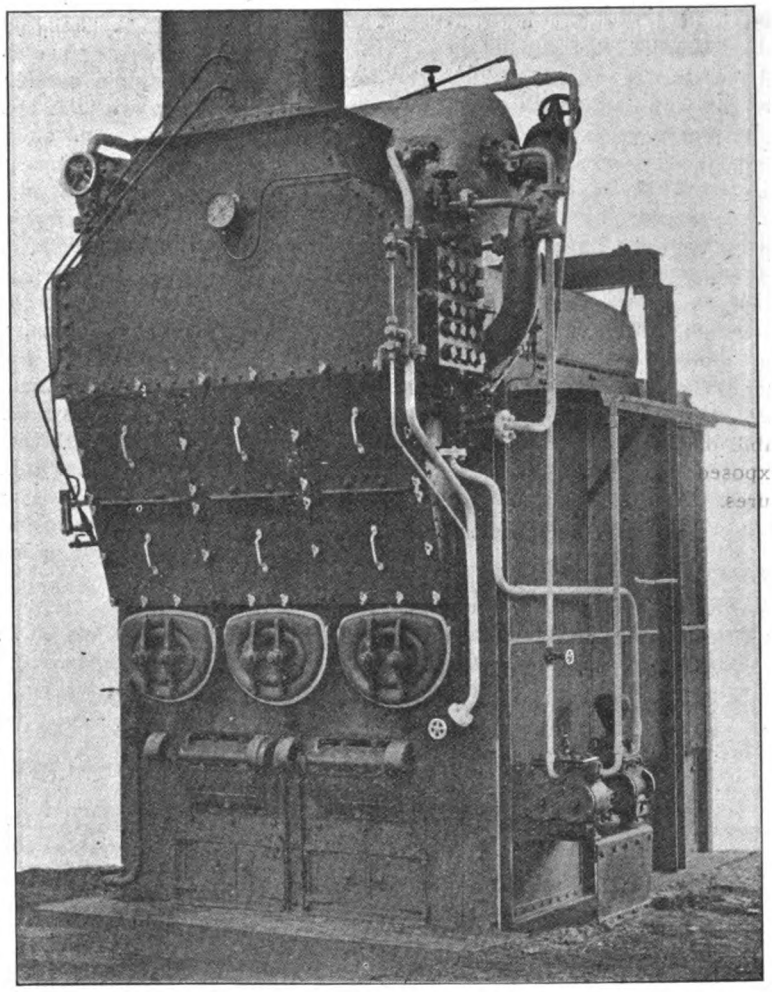
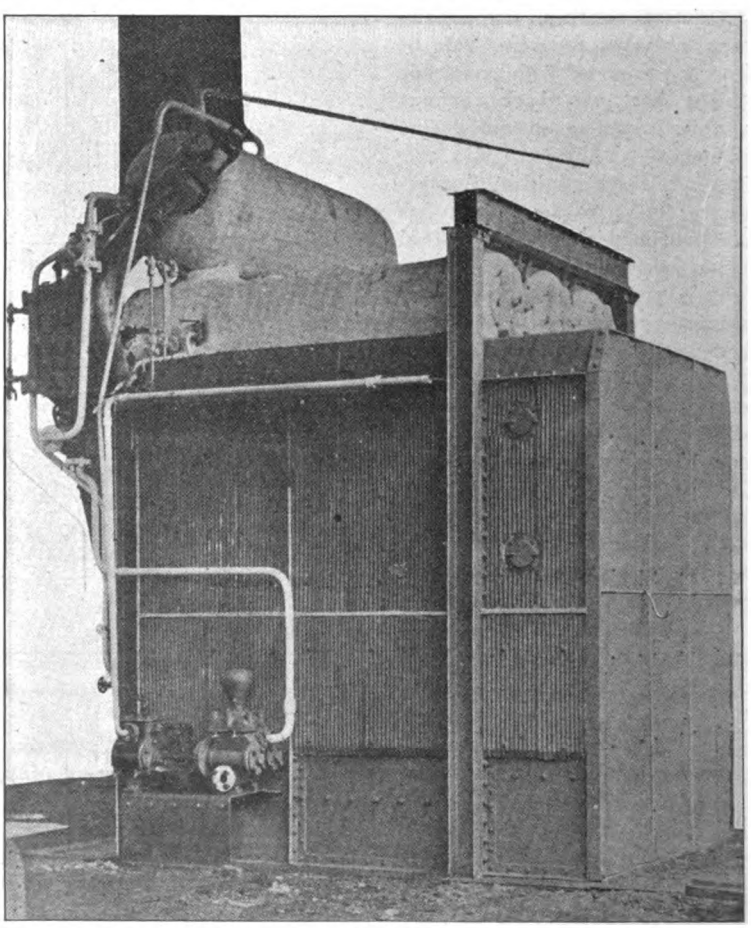


FRONT VIEW OF DAVIES PATENT WATER-TUBE BOILER.

THE DAVIES NEW WATER-TUBE BOILER.

Our illustrations show a new type of water-tube boiler which is being put upon the market by the Davies Patent Boiler Co., Ltd., of Victoria street, London, and it is claimed for it, among other things, that in the event of a tube bursting, the steam arising therefrom would follow the course of the draught in the direction of the uptake; that the water would leave the tube chamber only in the direction of the smoke, and hence that stokers would be able to draw the fires without danger. The boiler is constructed with a combustion chamber at the back with the object of ensuring the complete combustion of the gases before they circulate among the tubes in the boiler. At the same time this chamber facilitates cleaning, inspection, and repairing operations.

As will be seen from the illustrations, the boiler consists of a series of several elements of vertical straight tubes. These are built up of pairs of semi-cylindrical top and bottom half drums, united by a number of tubes, the diameter and length of which are varied in accordance with the heating surface and horsepower required, the nature of the fuel being used, and the method of stoking employed. The bottom drums form the roof of the furnace, while the upper drums form the roof of the tube chamber, with a steam receiver above. It is consequently impossible for the furnace gases to circulate around the tubes until they have passed to the rear of the combustion chamber. The boiler is slightly raised at the back, and a brick lined combustion chamber is constructed at the rear. There are no external downcomer pipes. About two-thirds or half of the back end tubes act as the upcast, and the other third or half, act as downcomers, according the rate of working; the circulation of the water and steam is indicated by means of the arrows. A leveling pipe and mud collector are provided at the front under the ends of the lower drums, and a blow-off is attached to the scale collector. Hand holes are formed in the top drums for access to and withdrawal of the tubes, and manholes are made in the ends of all the drums large enough to allow a man to enter them for inspection, cleaning or repairs. Hinged smoke-box doors are fitted to the front of the boiler as in marine type or dry-back boilers. Between the elements of the boiler are inserted horizontally superheater tubes, which extend to about three-fourths of the length of the tube chamber. These tubes are expanded into steel boxes provided with hand holes for renewal or repair



BACK VIEW OF DAVIES PATENT WATER-TUBE BOILER.

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of the tubes. The path of the gases through the boiler is similar to that in an ordinary marine type boiler. The gases from the furnace pass beneath the lower drum and into the combustion chamber where they mingle with hot air passed in through hollow fire-bars. The mixture then circulates through the tubes and passes on to the superheater, and thence to the funnel through an economizer, which is placed in the smoke-box.

Below is a comparison supplied by the makers between an ordinary Scotch boiler and a boiler of the Davies type with the difference in favor of or against the latter:

Scotch Type Marine Boiler.	Davies Boiler.	Difference.
Height, 16 ft.	17 ft. 9 in.	Loss, 1 ft. 9 in.
Width, 16 ft.	10 ft. 6 in.	Gain, 5 ft. 6 in.
Length, 12 ft.	12 ft. 3 in.	Loss, 3 in.
Heat surface, 2,655 sq. ft.	3,200 sq. ft.	Gain, 545 sq. ft.
Grate area 57.75 sq. ft.	57.75 sq. ft.	Same.
Weight, boiler 57 tons	27 tons	Gain, 30 tons.
Weight, water 37 tons	7 tons	Gain, 30 tons.
Total .... 94 tons	34 tons	Gain, 60 tons.
Evaporation, 12,500 lbs.	15,500 lbs.	Gain, 3,000 lbs.
to 15,000 lbs.	20,000 lbs.	Gain, 5,000 lbs.
Steam, 200 lbs.	225 lbs.	Gain, 25 lbs.
Floor space, 192 sq. ft.	128 sq. ft.	Gain, 64 sq. ft.

The following table has also been prepared by the Davies Patent Boiler Limited, for comparison only, from particulars contained in the report of Navy Boilers, June 12, 1904, published the British Admiralty Committee on by His Majesty's Stationery Office.

RELATIVE WEIGHTS

In the case of the Hermes, the Medea, and the Medusa, the new boilers were installed without any alterations being made in the stokehold floor spaces. A comparison of weight and maximum output of the boilers gives the following results.

Type of boiler.	Ship.	Weight of Boiler Room Installation, tons.	Maximum Output of Steam per Hour, lbs.	Output of Steam per hour, per ton of Boiler room weights, lbs.	
Cylindrical	Saxonia	1,000 (abt.)	132,600	132.6	
Water-tube	Minerva	567	167,100	295	With retarders.
Water-tube	Minerva	558	156,200	280	As originally fitted.
Water-tube	Hyacinth	454	178,700	394	
Water-tube	Medea	330	157,800	478	
Water-tube	Medusa	314	158,000	503	
Water-tube	Hermes	490	200,000	410	With vertical baffles, and forced air supply above the fires.
Water-tube	Hermes	481	182,300	380	As originally fitted.
Water-tube	Sheldrake	125	43,840	351	
Water-tube	Espiegle	95	24,780	261	
Water-tube	Seagull	135	48,450	359	
Water-tube	Fantome	76.5	22,750	297	

The following figures are based upon results of tests of the Davies patent boiler contained herein. These figures are set out here for convenient comparison with the above:

Type of boiler.	Ship.	Weight of Boiler Room Installation, tons.	Maximum Output of Steam per Hour, lbs.	Output of Steam per hour, per ton of Boiler room weights, lbs.	
Davies		330	198,000	600	No baffles between tubes.

STABILITY OF SUBMARINE BOATS.

Sir William White, in his Royal Society paper, entered with characteristic lucidity upon a series of calculations to determine the conditions of stability of submarine boats in varying conditions which may occur in service, with particular reference to accidents which have happened. One of the chief causes of these accidents is the singular variation in stability and buoyancy produced by changes in the draught of water and the trim of the vessels. Submarines may reach a considerable depth below the surface and be exposed to severe external fluid pressures. Ample structural strength must be provided to meet these pressures, and to prevent deformation of the vessels. In order to fulfil this object with moderate weights of structures, submarines are made cigar-shaped, with circular cross-sections. The cigar-shape is usually somewhat disguised by light superstructures built above the upper surface of the hull proper, and carrying decks or platforms, which add to the comfort and convenience of the crews when the vessels are floating at the surface—in the "awash" condition — at their lightest draught. In that condition water is excluded from the spaces between the superstructures and the cigar-shaped hulls, and the buoyancy and stability are sensibly increased. In the awash condition the maximum reserve of buoyancy is six per cent of the displacement, whereas the minimum accepted for any class of warship is 10 per cent; in modern battleships and passenger steamers it is from 80 to 100 per cent; cargo steamers, 25 to 40 per cent. The other extreme condition at the surface is when the submarine has been "trimmed" for driving and floats with a very small portion of her hull above water. This is effected by admitting water ballast into tanks specially constructed for the purpose and of known capacity. The final adjustments of draught and trim during the process of trimming require, in Sir William's view, great care. All openings into the interior are closed and secured in a watertight manner before trimming is commenced. Water is also allowed to enter the spaces between the superstructures and the cigar-shaped hull, and to remain in free communication with the surrounding water, so that the lightly-constructed superstructures may sustain external pressure when the vessel is submerged. Diving is accomplished by giving the submarine headway and so manipulating horizontal rudders that the bow is depressed. The stream-lines developed in the water by the onward motion produce downward pressures on the upper surface of the hull towards the bow. The vertical component of these pressures overcomes the vertical component of the rudder pressures and the small "reserve of buoyancy" which the submarine retains, and the vessel moves obliquely downwards until the desired depth below the surface is reached. The horizontal rudders must be then manipulated by a skilled steersman in such a manner that further motion (although really along an undulating course) is practically at a constant depth below the surface. When headway ceases both rudder pressure and stream-line motions disappear, the small reserve of buoyancy reasserts itself, and the submarine rises to the surface. Having analyzed the stability conditions under all these conditions, Sir William enforced the conclusion that in the design of submarines the calculations for stability require to be worked out by naval architects to an extent which is not necessary for ships of ordinary form, and that each departure from precedent must be most closely scrutinized and exhaustively considered. It is true, no doubt, that for the diving and submerged conditions the essential point is to deal accurately with questions of weight and position of the center of gravity, since stability in all directions when submerged depends upon the relative positions of the centers of gravity, and buoyancy and moderate "metacentric heights" have

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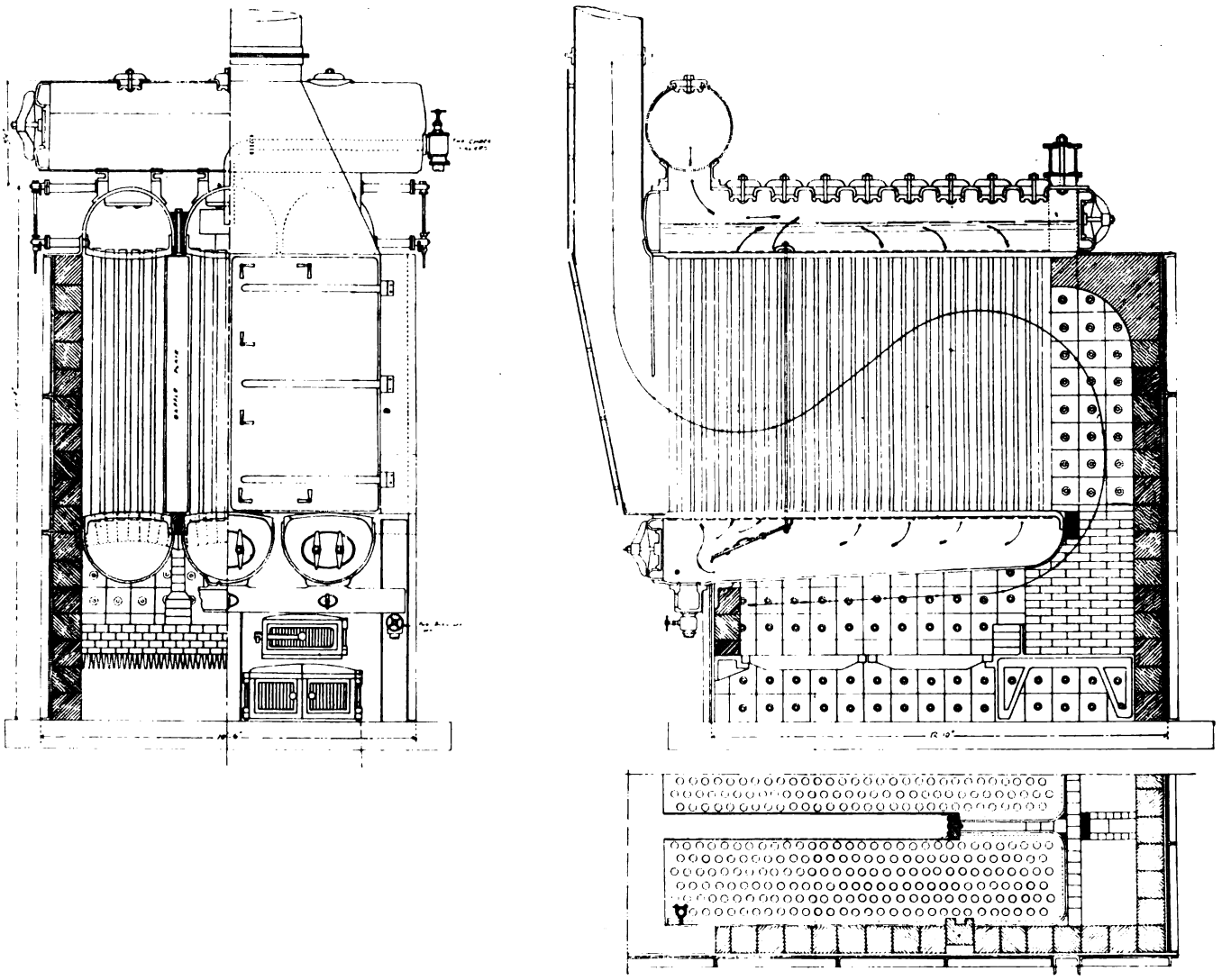

SECTIONAL VIEW OF DAVIES PATENT WATER-TUBE BOILER.

to be accepted. On the other hand, it is certain that equal attention should be directed to the conditions and in stages of immersion between it and the diving condition. Submarine design is not a task to be entrusted to amateurs or imperfectly informed persons. All of which goes to prove that the admiralty have done well to utilize the best experience of submarine design and to take every conceivable precaution against this experience being dissipated for the benefit of foreign navies.

FLOATING DOCKS. — ACHIEVEMENTS AND POSSIBILITIES.

In the October number of the *World's Work* there is an interesting article by Mr. Frederick A. Talbot on "The Importance of Floating Docks." He points out that the ships of the world are increasing so rapidly in size that the problem of providing dry docks large enough to accommodate them is a perplexing one. London, he observes, does not possess either a wet or a dry graving dock with an entrance exceeding 80 ft. and 68 ft. respectively. Consequently, if the Lusitania or the Mauretania ever required docking in London, their phenomenal beam—88 ft.—would make it impossible. It is suggested that the Thames might build warships with a beam exceeding 80 ft. but for the lack of docking facilities. Mr. Talbot goes on to point out that the graving dock can be built more rapidly than the ordinary dock of the same kind on shore. Yet, strange to say, it has not been very generally adopted in this country. Great Britain possesses only eighteen floating docks out of a total of some 240 dry docks of all descriptions, whereas in the Baltic ports twenty-two out of sixty docks are of the floating type, and in North America the proportion is even higher—fifty-three out of seventy-five. The article proceeds:—

"According to tradition, the floating dock idea originated with a sea captain in the Baltic sea, who, desirous of repairing the copper under-water sheathing of his ship, cut down a disused vessel, the Camel, removed her stern and internal fittings, so that only the bare hull remained, and fitted a water-tight gate. The eviscerated hull was then submerged, the vessel of the ingenious captain warped inside, the gate closed and the water pumped out of the Camel, so that it slowly rose to the surface, at the same time raising the ship berthed within, so that the latter was at last high and dry, ready for the requisite overhauling."

Attention is called by Mr. Talbot to the fact that the latest floating dry docks, instead of being constructed in one piece, are now built in sections, which may be detached from each other, so that the dock will really dock itself, and can in consequence be maintained in a high condition of repair. The type in most general use is that in the shape of a square-cornered "U," but one side depositing pontoon docks are also in favor. In

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their case there is a pontoon dock in the form of fingers, which slide between the bars of the gridiron. The dock is then submerged and withdrawn from the staging, leaving the handled vessel deposited on the grid. Such docks are only available where there is plenty of room and the harbor is practically non-tidal. Mr. Talbot observes that many of our river ports, such as those of the Mersey and the Thames, are not suited to the use of the floating graving dock, because the cost of dredging and excavating the river bed for the mooring site of the structure is practically as great as the construction of a masonry dock. In such cases the relative cost of the two systems has to be carefully studied. At Bermuda, for example, the removal of coral, to give sufficient depth, cost nearly £60,000. On the other hand, the cost of a masonry dock often appears to be less than it really is, as the ballast which is excavated may have a commercial value. Thus, at Liverpool the soil is composed of red sandstone, which is greatly in demand at remunerative prices.

The author of the article suggests that the floating dock of medium lifting capacity—6,000 to 8,000 tons—would be welcomed at various points on the trade routes, because a tramp steamer often has to travel many thousands of miles before an opportunity offers for docking and cleaning. If the vessel were able, quickly and cheaply, to undergo cleaning at points along the route, her speed would be increased and her fuel consumption reduced. It is pointed out that in small docks trawlers can be lifted high and dry above water in 15 to 20 minutes, tramps up to 3,000 tons in 30 minutes, vessels of 5,000 tons in 45 minutes, and those of 10,000 tons in 90 minutes. These speeds have not been approached by the latest masonry graving docks, fitted with the most powerful pumping plants. It is remarked that before a ship can enter a masonry dock the latter must first of all be emptied to prepare the keel blocks, filled again, the vessel berthed, and the dock finally emptied. With the floating dock, however, as its normal position is for the pontoon dock to be above the water level, the blocks can be prepared directly intimation is received that a vessel desires docking.

Mr. Talbot says there is a dock projected for a continental port with a lifting capacity of 36,000 tons, or twice the power of the American Dewey dock, which is at present the largest. A floating dock capable of lifting the new Cunard turbine express steamers of 45,000 tons displacement could, he says, be built for £170,000. If it were moored in Dover harbor, where there is ample depth of water, the cost would be considerably less than that of a masonry dock; but if it were placed, say, in the Mersey, the cost of excavating the site would be such that it would be cheaper to build a masonry dock of similar dimensions. Mr. Talbot argues that the advantage is on the side of the floating dock as regards cost of working. As only one quarter of the power is required to lift a vessel as compared with the graving dock, the coal consumption is necessarily 75 per cent less. Moreover, the coal consumption is in direct proportion to the weight of the ship to be lifted. The cost of maintenance is said to range, on the average, up to 1.66 per cent of the initial cost of the floating dock. In the case of the masonry docks the maintenance expenses are confined to the gates, keel blocks, and shores for supporting the docked craft. The floating dock, being built of steel, requires continual repair.

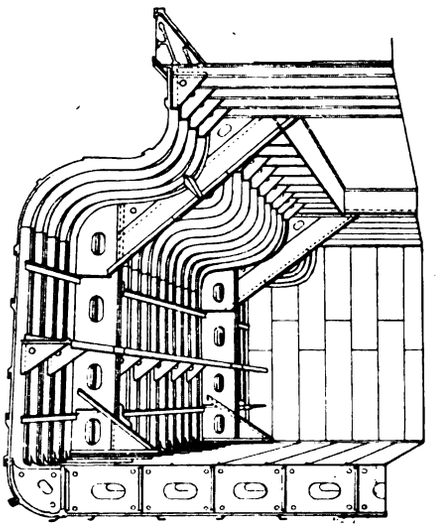
As to durability, there are still in operation four floating docks which were launched before 1870. "A floating dock, therefore, which is kept in proper repair, may have a life of 50 years, at the end of which time, owing to the progress of steamship development, it may be considered out of date." In conclusion Mr. Talbot says: "The recent construction of mammoth battleships of the Dreadnought class has reawakened interest in the possibilities of the floating dock. Few countries possess graving docks of sufficient capacity to handle these vessels, and as it will be impossible to excavate special docks for their accommodation by the time the vessels are ready for service, the floating dock is being requisitioned. At the present moment one continental power is arranging for the lengthening of an existing floating dock for this purpose."

The tug Oneida which was smashed by the steamer C. B. Hill in Detroit river some weeks ago is beyond repair and has been abandoned by her owner, Capt. W. G. Harrow. While there is no insurance on the tug, Capt. Harrow received $3,000 from the Hill's underwriters in settlement of the damages.

The Fort Wayne Electric Works, Ft. Wayne, Ind. have just issued bulletins No. 1082, 1083, 1084 and 1085, descriptive of the multiple, alternating current street arc lighting system, types MA and M induction motors, standard switchboard panels for multiphase generators and integrating switchboard watt-meters, type K, form SAC.

TURRET VESSELS.

6147. C. D. Doxford, Sunderland. Turret vessels. [Fig. 1.] This invention relates to vessels of the turret type, in which the turret A is in the form of a continuous girder somewhat narrower than the breadth of the vessel, and extending over the whole or greater portion of the length of the vessel, and providing a longitudinal strengthening frame or girder at the upper part of the vessel. In carrying out this invention the hull is divided into different holds or compartments



by transverse bulkheads B; the horizontal transverse beams and vertical stanchions at present used in these types of vessels are dispensed with. By this means a clear space is left in each hold, as illustrated in the drawing, and it is possible to stow under hatches lengthy and bulky pieces of cargo, such as hitherto have always had to be carried as deck loads. Any parts of the frame or hull can be strengthened in any desired manner where necessary; for example, specially strong frames or webs C and gusset-plates D may be placed at intervals along the side walls E, and the large gusset-plates F may be provided in those portions where the turret merges into the side walls of the vessel. Again, the frames or the alternate frames may be made heavier or deeper than usual, with or without special webs and gusset-plates, or any other suitable means may be employed to fortify the walls and do away with the necessity for the beams or stanchions which interfere with the loading, storing and discharging of the cargo. In the case of 'tween-deck vessels, the strong transverse beams at the harbor deck, or corresponding level, and the ordinary vertical stanchions in the upper compartment of the cargo hold are dispensed with.

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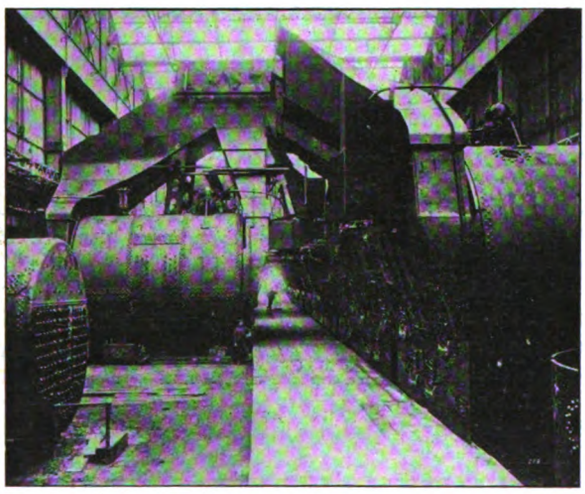
Cunard Express Liner Mauretania.

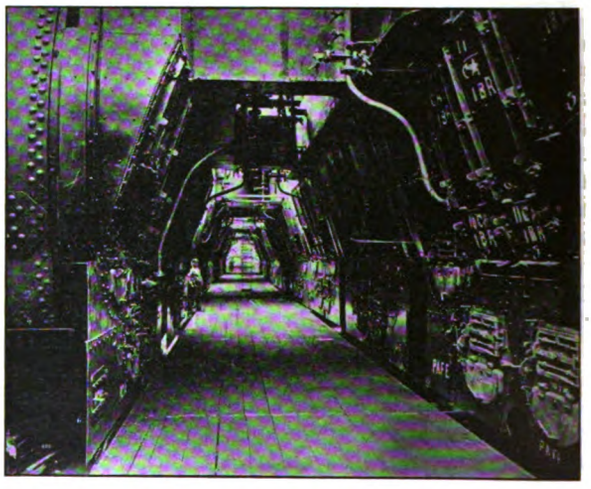
It is no exaggeration to say that the construction of the Mauretania, launched Sept. 20, and the sister steamer, the Lusitania, launched somewhat earlier, represents by far the most stupendous task ever entrusted to ship builders. Not only will these vessels be the largest, fastest and most luxuriously appointed passenger steamships afloat, but the owners and builders, in adopting the steam turbine as a means of propulsion, have made an important departure, as hitherto all the high speed liners on the Atlantic have been fitted with reciprocating engines. In considering the design of the Mauretania and Lusitania, a committee, on which the Cunard company, the admiralty, Messrs. Swan, Hunter & Wigham Richardson, Ltd., and Messrs. John Brown & Co., Ltd., were represented, was appointed to investigate the relative merits of reciprocating engines and turbines for the vessels. After research and experiment extending over several months, the committee unanimously reported in favor of the adoption of steam turbines on the Parsons principle, and the Cunard company accepted their recommendation. The Cunard steamship Carmania followed in design, but being a smaller vessel with much less power was completed earlier. As Wallsend was the birthplace of the Parsons marine steam turbine, it is fitting that the Tyneside borough should also be the cradle of one of the mighty vessels with turbine engines from which so much is expected. The conditions laid down in the agreement entered into in 1903 by the Cunard Steamship Co. involved the construction of two steamships "capable of maintaining a minimum average speed of from 24 to 25 knots (say 27½ to 29 statute miles) per hour in moderate weather." This speed will enable the vessels to reduce the passage from Queenstown to New York (a distance of 2,835 knots) to about five days, thus winning back from the Germans "the blue ribbon of the Atlantic."

THE MAURETANIA'S BUILDERS.

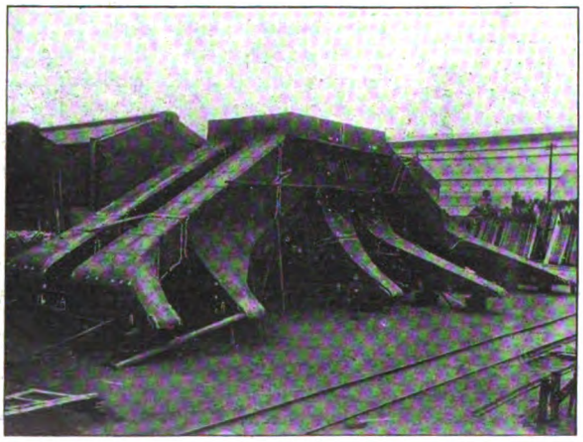
A cursory inspection of Messrs. Swan, Hunter & Wigham Richardson's famous establishment at Wallsend impresses the onlooker with the courage and enterprise with which the directors entered on their great task, and proofs are not lacking that in future years the construction of the Mauretania will be recorded as one of the River Tyne's greatest triumphs as a ship building center. The large sheds under one of which the liner has been built are examples of the magnificent equipment of the Wallsend ship yard. These structures are of girder lattice work, roofed with glass, and are 740 ft. long, with a clear inside width of about 100 ft. and a height of 144 ft. The protection afforded by the shed from the weather has enabled work to be carried on without interruption; while the numerous electric overhead cranes, supported from the roof, have been invaluable in placing in position the heavy weights wrought into the hull of the Mauretania. Alongside the ship yard may also be seen the great floating crane which Messrs. Swan, Hunter & Wigham Richardson have specially provided for lifting the boilers, turbines and other



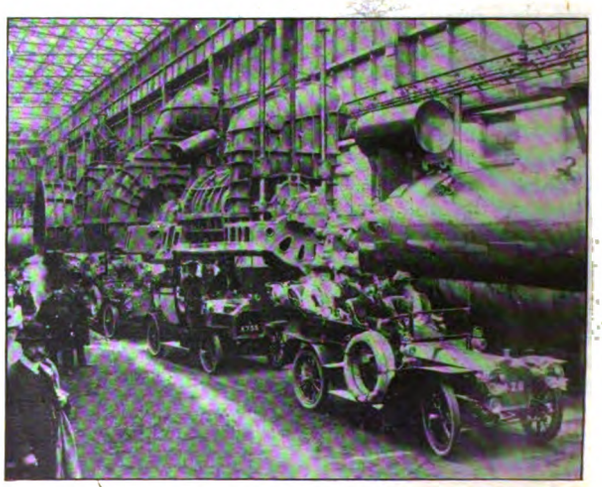
VIEW OF MAURETANIA'S BOILERS AND UPTAKES.



SOME OF THE MAURETANIA'S BOILERS AND FURNACES.



ONE OF THE UPTAKES WHICH CONDUCTS THE SMOKE AND WASTE GASES FROM THE FURNACES TO THE FUNNELS.



COMPARATIVE SIZE OF TOURING CAR AND MAURETANIA'S TURBINE CASINGS.

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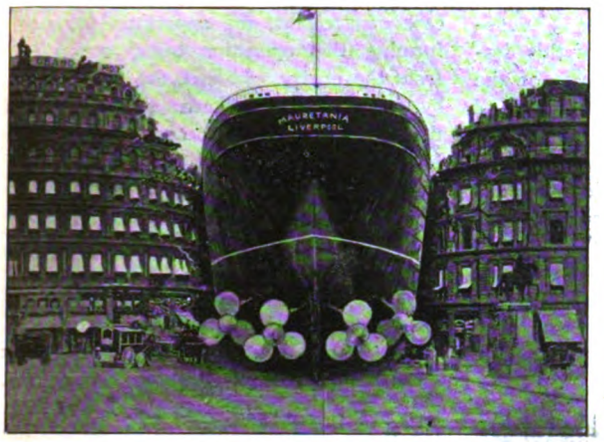
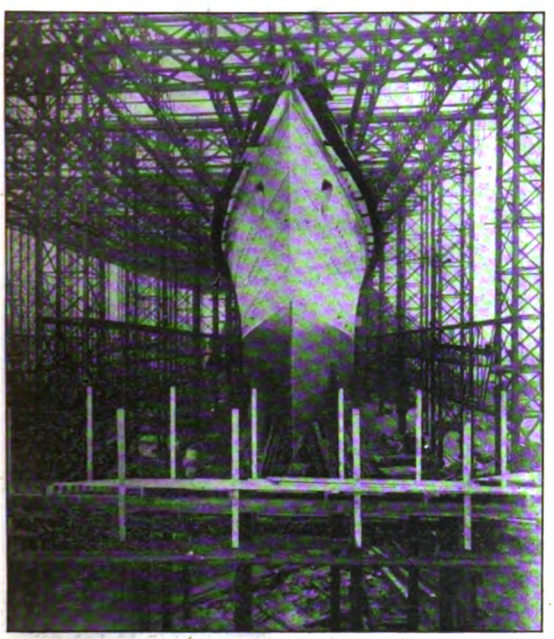
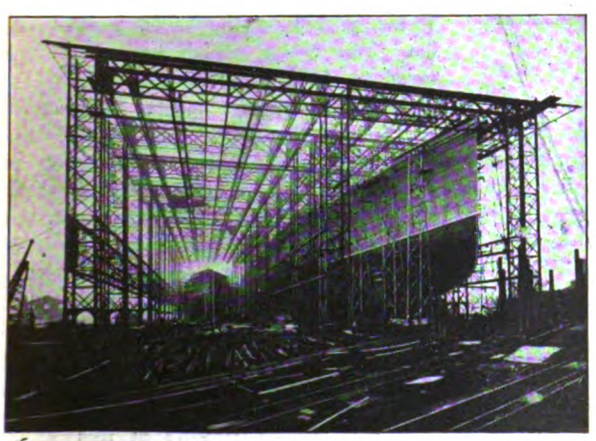


NORTHUMBERLAND AVENUE, TRAFALGAR SQUARE, LONDON.

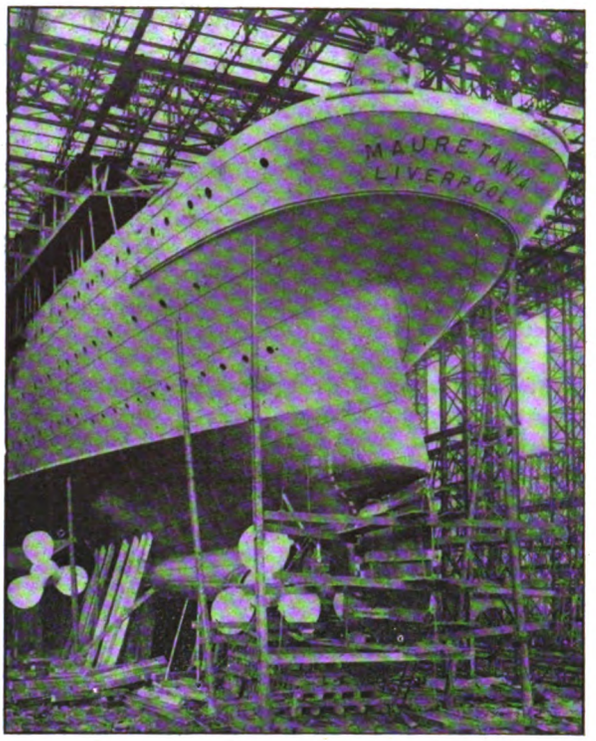
The buildings in the avenue would be completely wrecked were the Mauretania placed in this thoroughfare. The avenue is 84 ft. wide, while the ship has a beam of 88 ft.



BOW VIEW OF MAURETANIA ON THE STOCKS.

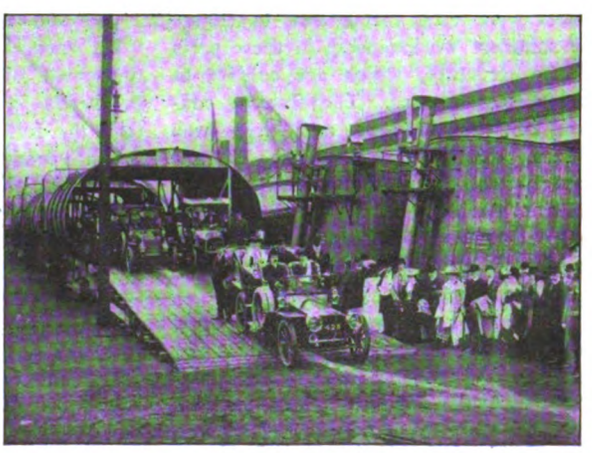


CUNARD EXPRESS STEAMER MAURETANIA, 32,500 TONS. THE STEAMER SHOWN BUILDING ALONGSIDE IS OF 8,300 TONS CAPACITY.



STERN VIEW OF MAURETANIA ON THE STOCKS.

MAURETANIA AFTER LAUNCHING.



AUTOMOBILES ABREAST IN MAURETANIA'S FUNNELS.

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heavy weights on board the vessel after launching. This crane—one of the most powerful in the world—is capable of lifting weights up to 170 tons.

THE VESSEL'S DIMENSIONS.

The following are the leading particulars of the Mauretania: Length over all, 790 ft.; length between perpendiculars, 760 ft.; breadth, molded, 88 ft.; depth, molded, 60 ft. 6 in.; gross tonnage, 33,200 tons; net tonnage, 11,900 tons; maximum draught, 37 ft. 6 in.; displacement at maximum draught, 45,000 tons.

For the assistance of our readers in considering the proportions of the new vessel, we append a table giving the leading particulars (as published) of the recently constructed Atlantic greyhounds and of the historic Great Eastern.

Name.	Length over all, ft. in.	Breadth. ft. in.	Depth molded, ft. in.	Gross tonnage.	Displacement.	Total I. H. P.	Atlantic speed, knots.
Kaiser Wilhelm II	706 6	72 0	52 6	20,000	26,000	38,000	23½
Deutschland	684 0	67 0	44 0	16,502	23,620	36,000	23¼
Kronprinz Wilhelm	663 0	66 0	43 0	15,000	21,300	36,000	23¼
Kaiser Wilhelm der Grosse	648 7½	66 0	43 0	14,349	20,880	30,000	22½
Campania and Lucania	622 0	65 3	41 6	12,500	18,000	30,000	22
La Provence	627 0	65 0	41 7	14,744	19,190	30,000	22
St. Paul and St. Louis	554 2	63 0	42 0	11,629	16,000	18,000	21
Oceanic	704 0	68 4	49 0	17,274	28,500	27,000	20½
Great Eastern	695 0	83 0	57 6	24,360	27,000	7,650	13-14

THE HULL.

The keel of the Mauretania consists of three thicknesses of plating, varying in thickness from 1 in. to 1¼ in. These plates were clamped together, and the holes through the three thicknesses of plating were drilled by means of portable electric drills, thus securing perfectly fair holes and avoiding the deterioration due to punching thick steel plates. The hull has been constructed on the cellular double bottom principle, with solid floors on every frame. The double bottom is 5 ft. deep at the center line. Its extension well up the sides of the ship will afford great additional protection in the event of the liner grounding, at the same time giving structural strength transversely and longitudinally. For the riveting of the keel, center keelson, floors, shell plating up to the turn of the bilges, and upper strakes of the shell and stringer plates, hydraulic riveting machines were used throughout, to ensure the soundest workmanship in these parts of the structure, which are subject to the greatest stresses. The framing consists of channel bars and deep web frames, closely spaced. The channel bars extend from the margin of the cellular double bottom to the shelter deck, some of these bars having a total length of about 55 ft. and weighing about three-quarters of a ton.

The number and weight of butts and overlaps have been minimized by using plates of very large size. The shell plates and the heavier plates on the decks are in most cases 35 ft. long, and weigh 2½ to 3 tons each. In some instances, however, the length of the plates is 48 ft., weighing 4 to 5 tons—a record size for ship plates of this description. Another notable feature of the new Cunarder is that in the top part of the structure, which will be subject to great stresses when the vessel is in a seaway, special high-tensile steel has been employed, all holes being drilled, and rivets put in by hydraulic riveters. About 26,000 steel plates were used in the shell, decks, bulkheads, casings, etc. of the vessel. Over 4,000,000 rivets were worked into the ship, weighing about 500 tons.

ARRANGEMENT OF DECKS.

In all, the Mauretania will have nine decks—the lower orlop, the orlop, the lower, the main, the upper, the shelter, the promenade, the boat and the sun decks. The promenade and boat decks are above the main structure of the vessel. In addition a tier of deck houses, running for about half the length of the ship, is erected on the boat deck, the whole being surmounted at the fore end by the commander's bridge, which is about 100 ft. above the keel. The two pole masts will rise 210 ft. above the same level. On the suggestion of Messrs. Swan, Hunter & Wigham Richardson, the Cunard Co., adopted in the Ivernia, Mauretania and Lusitania an arrangement by which the width of the promenade and boat decks is increased. These decks in the new sister ships extend 21 in. beyond the shelter deck on each side of the vessel. The projection does not extend beyond the greatest width of the hull; hence, there is no danger of the promenade and boat decks fouling any landing stage or quay when the vessel is in port.

SUBDIVISION OF THE HULL.

To ensure the safety of the ship in the event of collision, the longitudinal bulkheads forming the side bunkers extend the full length of the boiler spaces and are made water tight as are also the lower deck throughout and the main deck in the way of the engine and boiler spaces. The transverse bulkheads between the various compartments are of special strength, equal to sustaining a head of water on one side at the greatest level to which the water could possibly rise in the event of one or two of the compartments being in communication with the sea. All watertight doors fitted to the main bulkheads are so arranged that they can be instantaneously closed in case of accident, the apparatus for performing this operation being controlled from the bridge. Indeed, the subdivision by watertight bulkheads and decks is the most elaborate that could be devised for a passenger vessel, the number of separate watertight compartments, 175, rendering the ship practically unsinkable.

THE MAIN CASTINGS.

The stern frame and brackets for supporting the propeller shafts are of cast steel. The main piece of the stern frame alone weighed very nearly 50 tons. To this main casting the two brackets for the inner shafts are connected by means of hydraulic riveting. The brackets for the wing or outer shafts, which terminate a considerable distance forward of the inner shafts, are connected by means of large flanges to the main structure of the ship. The rudder, which is of the balanced type and weighs about 65 tons is formed of steel castings, bolted together. It consists of three pieces, in addition to the forged ingot steel rudder-head of 25½ in. diameter. An unusual feature of the rudder is the design of the pintle. There being only one gudgeon on the stern frame, the pintle had to be made of very large size although in double shear, its weight being over 1¼ tons. By an ingenious arrangement, it is possible to withdraw the pintle and replace the bushings without disconnecting any part of the rudder or steering gear. The rudder and steering gear are entirely below the water line. The total weight of the main castings, including rudder, stem bar, stern frame and propeller brackets, exceeds 200 tons.

THE CHAIN-CABLES, ETC.

The iron links of the chain cables measure 3¾ in. diameter at the smallest part, and weigh 170 lbs. each. The chain is 1,900 ft. long, and weighs in all about 130 tons. Each of the four anchor shackles used to connect the 10-ton anchor to the cable, weighs 814 lbs. The cables, which were manufactured by Messrs. Brown, Lenox & Co., Pontypridd, are the largest ever made for the use of a ship. When tested, the links successfully withstood a tension of over 370 tons. It is noteworthy that the cables of H. M. S. Dreadnought, the largest battleship in the world, are only 2 11-16 in. diameter. The interior surface of the steel work of the Mauretania to the extent of about 620,000 sq. ft., is coated with Messrs. Wailes, Dove & Co.'s Bitumastic enamels and covering.

PASSENGER ACCOMMODATIONS.

It would be premature at this stage to attempt to fully describe the passenger accommodations of the Mauretania as it will be when completed, but the fol-

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lowing table gives the number of passengers, etc., that will be provided for:

First-class	560
Second class	500
Third class	1,400
Crew	800
Total	3,260

The promenade and living spaces allotted to the passengers are designed on a most generous scale, the space allowed for each passenger being about 50 per cent greater than in any other of the recently constructed Atlantic greyhounds. The decks with staterooms are, generally speaking, 9 ft. in height; but in the public rooms the height is from 10 ft. to 11 ft. Among special features in the new leviathan will be the regal and en suite rooms, the arrangement of the dining saloons, which provides for table d'hote or dining a la carte, in addition to the usual dining room, a veranda cafe, a nursery for the use of juvenile travelers, electric lifts for conveying passengers from one deck to another, electric baggage and other lifts, a complete telephone installation, giving communication between staterooms and the purser's office, etc., etc. A very complete electric light system, and electric power installation for driving the fans, both in the engine rooms and passengers' quarters will be provided. Nearly 5,000 electric lights will be fitted throughout the ship, current being conveyed by means of about 200 miles of electric cable. The electric light installation is being supplied by Messrs. W. C. Martin & Co., of Glasgow. The heating and ventilating arrangements of the passenger accommodation and of the vessel generally are receiving the most careful consideration, and each part of the ship will be supplied with warm or cool air as desired.

THE TURBINES AND BOILERS.

The Mauretania's turbines and boilers, with coal bunkers, occupy a total length of about 400 or 450 ft. amidships, with a depth from the main deck to the hold. The coal bunkers along the sides of the ship are so arranged that they will afford protection to the most vital and important parts of the vessel in the event of her being used as a cruiser or scout in time of war. The general arrangements of the turbines of the Mauretania and Lusitania are similar, but each building company has introduced certain minor differences in practice which from its knowledge and experience have been considered desirable. Two high-pressure and two low-pressure turbines are provided, each having a separate shaft and driving one propeller. The two low-pressure turbines are on the center shafts, on which are also fixed the reversing turbines. The total power will be about 65,000 or 70,000 I. H. P., equally divided through the four shafts, which will run at about 200 revolutions per minute. The condensers, circulating engines, air pumps, etc., all having their own separate steam engines, are placed in other water-tight compartments. Throughout, the machinery, as far as possible, will be duplicated, so that in the event of accident the vessel can always be worked by one set of engines. The shafting of the low-pressure turbines is about 33 in. in diameter, of Whitworth steel, and that of the high-pressure turbines 27 in., slightly increased near the glands. The line shafting, however, is about 20 in. in diameter; in all cases the shafts are hollow.

Steam will be supplied by 23 double-ended and two single-ended boilers, having 192 furnaces in all. The larger boilers are 17 ft. 3 in. in diameter and 21 ft. long. The working pressure of the boilers is 195 lbs., the turbines receiving steam at 160 lbs. Air is supplied to the boilers by Howden's system of forced draft, the fans being driven by electric motors; but the boiler power, it is expected, will be sufficient without forcing. The boilers will be arranged in four stokeholds, with five double-ended and two single-ended in the forward stokehold, and six single-ended boilers in each of the three others. The four elliptical funnels, each 23 ft. 6 in. by 17 ft. 6 in., will rise 152 ft. above the keel of the vessel. One of our illustrations shows the funnels lying end to end, as they appeared at the Wallsend slipway on the day of the launch. On that occasion a track was laid through the funnels, and many of the visitors were driven in motor cars through the long and novel tunnel thus formed.

LAUNCHING ARRANGEMENTS.

When the Mauretania left the ways, the weight in motion aggregated about 17,000 tons, a launching weight which has never before been equaled, and which considerably exceeds the combined weight of the battleships Agamemnon and Lord Nelson when they were placed in the water. The Lusitania's launching weight was about 1,000 tons lighter. Owing to the special facilities provided at the berth on which the Mauretania was built, Messrs. Swan, Hunter and Wigham Richardson considered it expedient to keep the vessel longer on the stocks, and consequently she was further advanced towards completion than the Lusitania was when launched. The mean bearing pressure on the ways when the vessel moved was 2.2 tons per square foot. At the point where the Mauretania was built, the river Tyne is only 780 ft. wide from bank to bank, or 10 ft. less than the total length of the ship. The building berth, however, was laid out at an angle to the line of the river, thus giving the vessel a run of about 1,180 ft. afloat. The ship started immediately the triggers were released, and traveled the length of the groundways in about 50 seconds, attaining a maximum velocity of 14 knots per hour. About 1,000 tons of drags were used to pull her up, the distance run after she left the ways being about 160 ft. The launching arrangements, which were eminently successful, were in the hands of Mr. Christopher Stephenson, the yard manager at the Wallsend establishment. It is computed that the launch was witnessed by 80,000 to 100,000 spectators, in the ship yard, on steamers afloat, and from points of vantage on both banks of the river.

ARRANGEMENTS FOR COMPLETION.

In order that the Mauretania may always keep afloat alongside the ship yard at all conditions of the tide, her berth has been dredged to a depth of 31 ft. at low water. Instead of the shear-legs or fixed cranes usually employed for lifting and placing heavy weights on board steamers after launching, Messrs. Swan, Hunter and Wigham Richardson have as previously mentioned, provided a self-propelling floating derrick crane of freight height and command, capable of lifting 170 tons. This crane—probably the most powerful in the world,—will bring the turbines, boilers, etc., from the engine works and place them in position on board the vessel, thus enabling the builders to complete the fitting out without moving the ship. Much of the internal work on board the Mauretania is considerably advanced, and a large part of the joiner work was ready to go on board immediately after the launch. About a year will elapse before the vessel will be ready for her sea trials.

The Newhall Chain Forge & Iron Co., 9-15 Murray street, New York, have just issued catalog No. 101 descriptive of their hand forged crane, block and hoisting machinery. The company does not advocate the use of an iron running over 50,000 to 51,000 lbs. a square inch, as it is apt to be brittle, crystallize easily and consequently unreliable, and, therefore, favor a lower test iron which possesses a high elongation and freedom from crystals, which means a longer life and better chain. The irons used in their crane and hoisting chains are especially tough and fibrous and are designed to stand the continuous strain and resist the constant friction of hoisting work. All the company's high grade chains are forged and welded by hand. Every chain in its entire length is actually proved and inspected before leaving the works. The catalog is well illustrated and is worth having.

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THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

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NOVEMBER 1, 1906.

THE JAPANESE INCIDENT.

Whatever rights we have guaranteed to the Japanese domiciled in the United States they should unquestionably be permitted to enjoy. And, if Japan has reason to think that her people are being denied such rights, it of course is proper for her to protest, and insist upon receiving what belongs to her. When the affront that she feels that she has suffered is one that suggests the social inequality of her people with our own, her recent achievements may well justify her in resenting it, even in the startlingly prompt manner that is of recent record and present keen remembrance. It is to be regretted that the sentiment in San Francisco should have induced the local authorities there to inflict such an insult upon the Japanese as was the case in excluding Japanese children from attending the schools open to American children. It is more to be regretted that the administration did not take the vigorous steps to correct this affront before it was all but forced to do so by the action of the Japanese ambassador at Washington. The mortification that the people of the United States must feel to be thus held up to the world by the nape of the neck, as it were, by Japan, and, of all reasons for that of bad manners, and soundly shaken therefor, is not conducive to that self-respect with which it is our wont to survey ourselves. For Japan to be able, and justly, to say to President Roosevelt, "step lively!" and for him to feel that he must step lively, both because Japan was in the right and because it is to our interest to mollify her, is pretty nearly as irritating to the American people, as a whole, as it would be for all of them, separately, to be compelled to wear a hair shirt.

The incident, however, is not without its warning. That is written large and clear across the political sky. Japan purposes being punctilious. Considering our form of government, considering state rights, considering the inability of the national administration to insure police protection at all times to people temporarily domiciled in this country, and considering the causes that, on the Pacific coast, have led to this slight upon the Japanese, we may well realize, and that profoundly, that it behooves us, as a nation, to prepare for any possible eventualities. That Japan is so "touchy" as to her rights, that it is so easy to increase the irritation her people at home may feel at the treatment accorded the Japanese here, indicates, unerringly, Japan's determination to exact rigorously from us—from us, at least—every consideration that is her just due. It is the rigor and the grimness of this manifestation of Japanese purpose that should solemnly warn us. The question is, will it?

Doubtless there will be things now in the Philippines that will, from time to time, attract not a few of our best warships there. It may be that the Philippines are not so peaceful as they should be. Doubtless our army out there should be largely augmented. One never knows what may happen—in the Philippines. It is well to be prepared for whatever may happen. That we are not now, is manifest; that we should be, is no less manifest. When Congressman Burton, at the coming session of congress leads his followers in the fight that we are all told is impending against a larger navy, he may find that his work is cut out for him. We think the Japanese, quite innocently no doubt, have removed the danger of a cessation of our naval program. We may thank her for that.

But what about a merchant marine? In an official report to congress at its last session, Admiral Dewey pointed out the need of swift scouts—no less than 24 of them—of a large number of squadron colliers, and of slow colliers, of ammunition and supply and refrigerating ships, of tank and distilling ships, of hospital and repair and torpedo depot ships, of dispatch boats, all to come from our merchant marine, upon call, for auxiliary naval needs in time of stress. He has pointed out, also, the value of the trained and experienced officers and men on board of our merchant ships, as a reinforcement for our navy, when needed. Have we got these vessels? Have we got these trained and experienced seamen? No, we have not. We have waited for them too long. The need of them has been more apparent recently, their need is more apparent today; it may be much more apparent tomorrow.

What are we going to do about it? Are we going to wait until Japan seizes and occupies the Philippines, until she annexes Guam and the Hawaiian islands, until she sends *her* merchant ships, filled with troops, horses, and munitions of war, protected by a large, a powerful, and a thoroughly experienced fleet of the most modern warships, to these points of aggressive action? Shall we wait until she has magnified her prestige world wide, as almost in a moment she may do, by these undertakings? Shall we suffer the shame and ignominy, no less than the loss of prestige, and the more substantial things that

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we shall also surely lose at the same time, to say nothing of our soldiers, our sailors, our warships and our other possessions?

Have we been *so* economical in respect to our oversea merchant marine this last half century that one of the consequences of that economy may be our almost irreparable injury and humiliation by Japan—by Japan? And what say the army officers of the United States, charged with the duty of foreseeing the needs of the country, militarily? In a report but ten months old that department, with the approval of Gen. Chaffee and Secretary Taft, said that we needed 120 American steamships of an average size of 6,500 gross tons each, and 108 American steamships of an average size of 5,500 gross tons each, or a total of 228 steamships, aggregating 1,374,000 tons, whereas we have but 57 seagoing merchant steamships of upwards of 4,000 tons each, aggregating 400,000, from which that department may draw for its need of merchant vessels for the transport of an army, and its equipment, to a distant scene of action. Again, what about it.

Shall we heed the warning we have received? Or shall we suffer the irreparable losses, the ignomy that surely awaits our further neglect to provide ourselves with that altogether too long neglected instrumentality of national defense—a large, powerful, and prosperous seagoing merchant marine, American - built American - officered and manned?

FREIGHT SITUATION.

The point of interest in the lake trade during the past week has been grain. Owing to the attractive figure at which this commodity is moving, a number of large vessels sought cargoes, with the result that grain poured into Buffalo faster than the elevators could care for it, the elevators being seriously crippled through the inability of railways to furnish cars. The prospect of having their vessels held up in Buffalo was not pleasing to vessel owners, some of whom took the train and personally saw to getting cargoes unloaded. This feature of the situation has caused a few owners to look dubiously upon grain. Shippers also, especially at Chicago, are somewhat skeptical about shipping grain to Buffalo without positive assurances from the railways that it will be forwarded from that point. Unless this condition mends considerable grain will go by the all-rail route to the seaboard. The week has been marked with some records in grain cargo carrying, the particulars of which will be found elsewhere in this issue.

Lumber tonnage continues in good demand at the attractive rate of $4 with cargoes reported to be plentiful.

No change is noted in the ore or coal trades. Water at the Lime Kilns was exceedingly low during the latter part of last week and quite a number of carriers were delayed.

LAUNCHING OF THE SIERRA.

The freighter Sierra, building at the yard of the Toledo Ship Building Co. for the Interocean Navigation Co., Duluth, was launched last Saturday morning without the usual christening ceremony. The Sierra was started by the Toledo Ship Building Co. for stock account but was sold before construction was far advanced. The steamer is 458 ft. over all, 438 ft. keel, 52 ft. beam and 28 ft. deep. The engines are quadruple-expansion with cylinders 16½, 24, 35 and 50 in. diameters by 42 in. stroke, supplied with steam from two Scotch boilers, 12 ft. 6 in. diameters and 10 ft. 4 in. long.

AROUND THE GREAT LAKES.

The Hines Lumber Co., Chicago, has purchased the barge S. J. Tilden.

The new dock machinery of the Wheeling & Lake Erie railway at Huron has been put in operation.

About ten new plates will be required to replace the damage done to the steamer Francis L. Robbins by the Sinaloa.

Capt. Thomas Whitley of Marine City, has sold the ferry steamer Comfort to Capt. Joseph Black of Sarnia.

Capt. James Reid, wrecking master, is of the opinion that the steamer Monkshaven, wrecked last fall on Pie island, can yet be saved.

The new steamer E. L. Wallace has just delivered the largest cargo of grain ever received at Erie. It consisted of 256,000 bushels of wheat.

Contract for replacing the wrecked center stand of the Interstate bridge at Duluth has been let to the Reid Wrecking Co., of Sarnia.

The duplicate of the steamer Harry Coulby, which the American Ship Building Co. is to construct, is to be built for H. K. Oakes of Detroit.

Wm. B. Davock, manager of the Shenango Steamship Co., was in Buffalo Sunday looking after the Wm. P. Snyder. He returned to Cleveland Sunday evening.

John J. Dougherty, of Erie, has shipped as second mate on the steamer William P. Snyder, to succeed James McCarthy, who went mate on the John Stanton.

The steamer Wm. B. Kerr, building at the South Chicago yard of the American Ship Building Co. for the Western Transit Co. of North Tonawanda, will be launched Dec. 1.

Capt. W. C. Richardson spent several days in Buffalo last week, hustling the steamer David Z. Norton out before Sunday. He returned to Cleveland Sunday evening.

At the Eastern elevator the cargo of 198,000 bu. of flax was taken out of the steamer J. T. Hutchinson in nine hours, 22,000 bu. an hour which is considered record time.

Chief engineer Theodore Meyers of the steamer Augustus B. Wolvin, was stricken with scarlet fever last week at Conneaut and put ashore. Second engineer C. W. Eaton is now in charge of the engine room.

The steamer Fayette Brown collided with the barge Bottsford near the Union Carbide Co.'s coal dock at Sault Ste. Marie. The Bottsford was struck on the starboard side and had to be beached to prevent her from sinking.

Major N. V. Judson, government engineer at Milwaukee, and Major Charles Townsend, government engineer at Cleveland, recently inspected the plans for the new dam to be built across the Des Moines rapids at Keokuk.

After getting several miles out of Chicago last week, the Anchor liner Wissahickon began blowing distress signals. Two tugs were sent out after her and towed her back into the river. The machinery was found to be disabled.

The Western line steamer Auburn, which stranded on Fighting Island a week ago last Sunday, was released on Friday last, and went to Amherstburg to reload the cargo that had been lightered on the Newman and Hammond.

Alterations to the Goodrich line steamer Alabama will make her 20 ft. longer than originally planned. A new feature will be the placing of six staterooms on the hurricane deck after the pilot house, each provided with private bath.

Bids were opened last week by Col. C. E. L. B. Davis, government engineer, for furnishing a dredging plant for removing shoals in St. Mary's river. The bids follow: Hickler Bros, Sault Ste. Marie, Mich., dredge No. 8, $15 per hour; James Pryor, Houghton, Mich., dredge Pryor No. 1, $17.75 per hour; Lake Erie Dredging Co., Buffalo, dredge Pan American, $32.50 an hour; Great Lakes Dredge & Dock Co., Chicago, dredge Columbia, $33.00 an hour. The bid of the Lake Erie Dredging Co. was accepted.

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REPAIRING THE MATAAFA.

The steamer Mataafa, of the Pittsburg Steamship Co.'s fleet, a victim of the great November storm last year, was docked July 29, 1906. Fig. 1 shows the damage done to bottom aft, affecting stern frame, crank and tail shafts, stern tube, propeller and plating. Amidships the vessel was broken in two and for 100 ft. at the after end of cargo space and 90 ft. in forward cargo space was pushed up, which was shown by the space between keel blocks and damaged part to the amount of 2 ft. The damage extends from the stern to the after end of cargo space, affecting the bottom plating, inside framing, tank top and the spar deck.

Two hundred frames in bottom, fifty on side, all the bulkheads in holds, half of tank top, shell plating, stern and deck houses forward are affected.

Although this is a large job, care must be taken not to remove too much at once, which prevents Supt. Williams making a record job of the repair work. A new deck house will be put on this vessel, as well as a doubling plate 23 ft. on the spar deck stringer. Figs. 2, 3, 4 and 5 show work done to September 13 and Figs. 6, 7 and to Oct. 13.

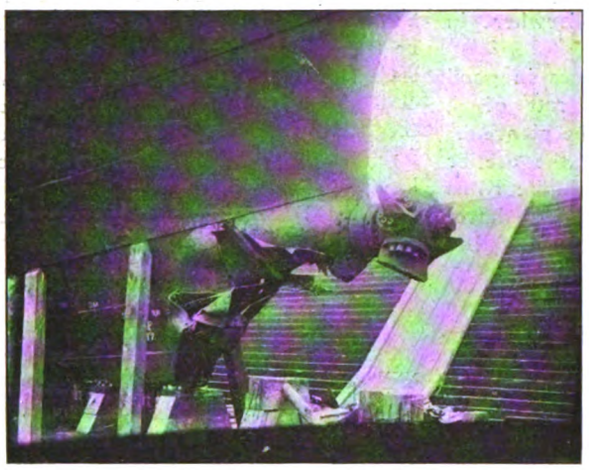

FIG. 1.—STEAMER MATAAFA, DOCKED JULY 29.

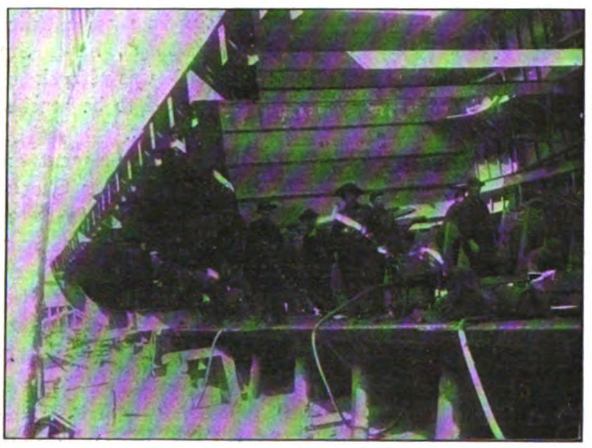

FIG. 2.—MATAAFA ON SEPT. 13.

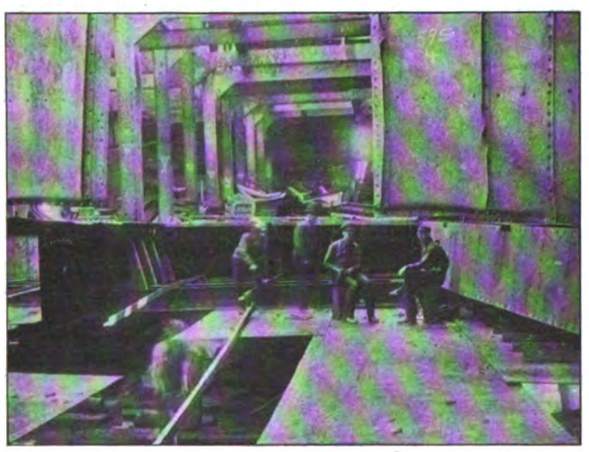

FIG. 3.—MATAAFA ON SEPT. 13.

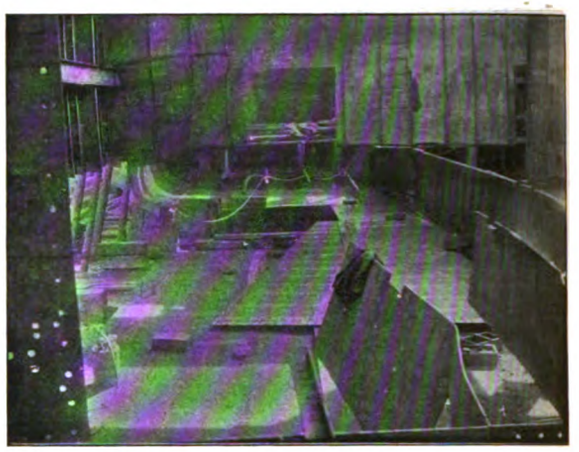

FIG. 4.—MATAAFA ON SEPT. 13.

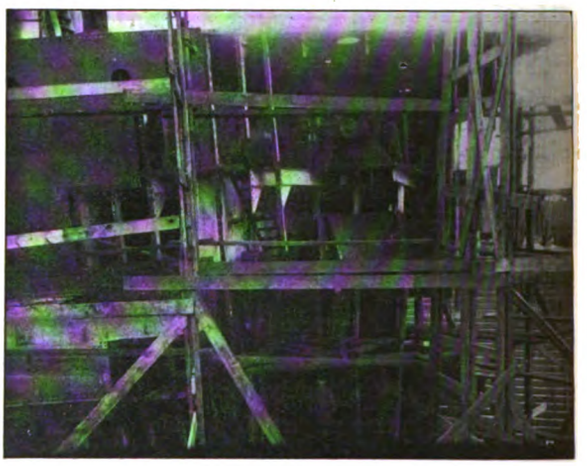

FIG. 5.—STEAMER MATAAFA ON SEPT. 13.

FIG. 6.—MATAAFA ON OCT. 13.

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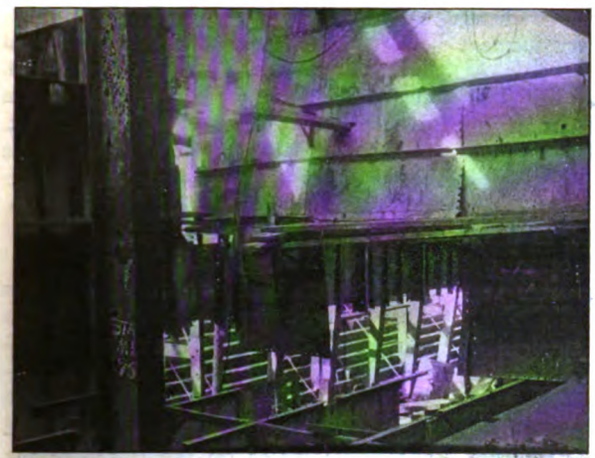


FIG. 7.—MATAAFA ON OCT. 13.

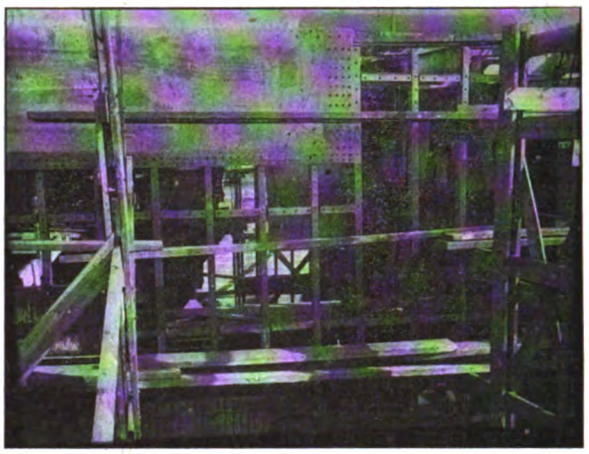


FIG. 8.—MATAAFA ON OCT. 13.

SARATOGA-ADIRONDACK COLLISION.

Herewith are published some photos showing the results of the collision between the steamers Adirondack, of the

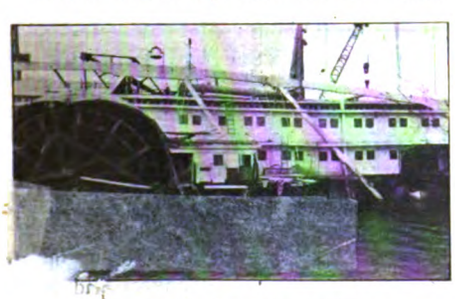
STEAMER SARATOGA.

People's line, and the Saratoga, of the Citizens' line, on the Hudson river at Cruger's island at 1 A. M. Oct. 13, the

VIEW OF ADIRONDACK'S PORT SIDE.

Adirondack being bound for Albany and the Saratoga for New York.

There was a fog bank off the island



SARATOGA'S CRUSHED WHEEL.

and they were both on the same course in a narrow channel. It was clear where each steamer was so that no whistles were sounded until the Saratoga entered the bank, when she blew her whistle, and within thirty seconds the steamer Adirondack was in collision, both having seen each other simultaneously, and both porting their wheels as they were coming head and head. On the swing they fouled one another as shown in the cuts.

Clarence Sherman, oiler on the Saratoga, was killed outright in the oil room, having just gone off watch. The steamer Saratoga's port boiler was knocked off her guard, and it fell in the river, giving the vessel a heavy list to starboard, and ten hours afterwards she sunk, having filled through port holes and hatches.

A woman in a stateroom abreast the boiler was slid right into the hall on a steel framed bunk, and only received a scratch on her head. The steel frame was stronger than the panel work, and it gave way.

On the Adirondack the freight clerk was lost overboard. The Saratoga's boiler has not been located.

The Chapman-Merritt Co. is raising the Saratoga with the derrick Monarch and tug John Nichols, and the H. Seymour with the tug Paul LeRoux, of the Albany Towing Co.'s fleet.

The local inspectors have not finished their investigation as yet, and have rendered no decision. The Onteora, of the Catskill line, is on the Saratoga's route. The Adirondack has not lost a trip.

Steamer Adirondack: Capt. E. S. Wilson; Pilots, John Shook and Isaac Sweet.

Steamer Saratoga: Capt. George Brown; pilots, H. S. Loucks and Isaac Lodewick.

LORD PIRRIE ON TURBINES.

Speaking at the 16th annual dinner of the Institute of Marine Engineers held in London on Oct. 3, Lord Pirrie, of Messrs. Harland & Wolff, ship builders, Belfast, said it was the duty of the Institute of Marine Engineers to antic-

ADIRONDACK'S PORT SIDE.

ipate ship builders' needs. What was wanted nowadays was deep docks, deeper harbors, wider entrances and larger

STEAMER ADIRONDACK.

graving docks. Referring to the turbine steamers recently launched for the Cunard company, Lord Pirrie said he appreciated very highly the courage and

ANOTHER VIEW OF SARATOGA.

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the pluck of the late chairman of that company, who was an old personal friend of his. He (Lord Pirrie) had urged before the subsidy committee that more money should be paid to the Cunard company as a subsidy in respect of these new turbine steamers. He believed the Cunard company decided that matter of the new boats for the benefit of the marine engineers, and also for the benefit of the country, and he believed the government did right in coming to the rescue in endeavoring to develop that new and, he thought, most important invention. Continuing, Lord Pirrie said: "I know many people will say, 'Why do you stand aloof?' I can only stand aloof because I cannot find those who wish to build 25 to 30 knot steamers. If I had such orders, I give you my word tonight, the turbine is what I should go for."

AT HEAD OF THE LAKES.

Duluth, Oct. 29.—During that part of the week before the storm which is now sweeping the lakes began to interfere, the shipments of ore were continuing to be better than last year. However, the docks at upper lake ports are feeling the delays in the departure of boats from Lake Erie and the sleet and snow at this end is retarding dock activity so that a small decrease may be expected in the last ten days of the month. Boats are beginning to come into Duluth, their pilot houses fringed with ice, but the ore in the docks is in no danger as yet.

The rate in grain from Duluth to Erie has fallen off a half cent, a number of charters having been made at 2½ cents. The freight to Buffalo is 2¾ cents with 3 cents asked by vessel interests. Despite reports to the contrary more grain by a large margin was shipped this last week than during the one preceding. However, the inability to move grain away from the lower end of Lake Erie will probably result in fewer cargos during the next week, as a large number of the grain boats are being delayed. The magnitude of shipments has been caused more by large cargoes shipped than by number of boats, for example, twice during the week record cargoes were loaded. The steamer B. F. Jones took 380,000 bushels of wheat, and the James Laughlin loaded at the Great Northern elevator in one day 393,000 bushels of flax. Another speed record is reported from Fort William where 198,000 bushels of wheat were loaded into the steamer W. D. Mathews from the Canadian Pacific elevator B in one hour and fifty-seven minutes, which is equivalent to about 1,695 bushels a minute. The best previous record was made by the James Laughlin at the Great Northern elevator at Duluth when a part of its cargo was loaded at the rate of 1,300 bushels a minute. The condition existing in the grain trade at present will cause a temporary increase in chartering for ore.

The statement of receipts and shipments of grain from the head of the lakes for the past two weeks is as follows, and indicates beside the increase in shipments of wheat a continued growth in the amount of flax handled, in which grain the Laughlin's record cargo was taken. Barley shipments also were very much larger.

	Receipts.		Shipments.	
	Oct. 21.	Oct. 28.	Oct. 21.	Oct. 28.
Wheat	2,101,841	1,836,735	1,717,613	2,185,595
Corn	4,897	6,392	———	31,182
Oats	282,060	210,156	163,166	219,405
Barley	539,455	443,887	298,807	1,015,095
Rye	32,975	48,485	68,232	51,189
Flaxseed	1,295,197	1,197,878	636,233	1,665,040

The condition of the coal trade remains practically as a week ago, with upper lake docks receiving considerably less than they would like to handle. Not only is the demand of the northwest and points reached from upper lake ports greater this year than before, but the railroads are failing to get the coal from the mines to Lake Erie for the boats and as a result coal stocks on local docks are much smaller than usual and will probably continue to be. It is still hoped that a marked stringency in the winter supply will be avoided, but coal will have to be carried right up to the close of navigation. This is not altogether undesirable in view of possible stormy weather.

The lumber carriers are taking cargoes at a splendid profit at present, with the rate at $4. However, lumber stocks are becoming low and nearly all of the shippers at Duluth have fulfilled their contracts. Some dealers who were unable to get boats previously are now seeking boats. Next season the handling of lumber at this port will be much improved and a much greater dispatch in loading will be obtainable. For this the new Northern Pacific railroad dock has been responsible and to a greater extent than the mere addition of a new dock would signify. Prior to the completion of the new dock much of the Northern Pacific lumber was transferred to the Duluth, Missabe & Northern railroad dock, the latter railroad receiving $2 per car. This business cut off, the Duluth, Missabe & Northern has entered into an agreement with the Duluth & Northeastern railroad, the logging road of the Cloquet Lumber Co., whereby its lumber is brought in D. M. & N. cars over the D. M. & N. road to the D. M. & N. dock at Duluth. This not only provides two routes for lumber into Duluth, the Northern Pacific being the other, but will permit of a car loaded with lumber at Cloquet at 6 P. M. reaching Duluth at midnight and being ready for loading next morning. Heretofore the arrival of a boat had to be anticipated several days in order to insure no delays in loading, but now the system is on much the same basis as the manner of handling ore.

To illustrate the speed of the railroad dock as compared with storage docks, mention is made of the loading of the steamer H. E. Runnels with 900,000 ft. of flat 12-inch boards in 18 hours. This means 50,000 ft. an hour, or a car of lumber every half hour.

STORM VICTIMS.

The storm on Saturday last was the most severe that has visited the lakes this year. The steel package freighter Lackawanna, owned by J. J. McWilliams, of Buffalo, struck the submerged breakwater crib at Cleveland and was impaled on the riprap of the crib with a hole 11 ft. long and 6 ft. wide in its bottom. As there was great danger that the steamer might be thrown against the seawall of the breakwater itself, the life savers took off the crew. The Lackawanna was abandoned to the underwriters by the owners. Her pilot-house, bridge and everything on deck forward has been carried away. Capt. Howard Baker, of Detroit and Capt. James Reid of Sarnia, wreckers, will examine the steamer and submit bids to Mr. Parry Jones, representative of the underwriters, for releasing her.

The barge M. B. Grover, of the Bradley fleet, lying in shelter in the breakwater at Cleveland caught fire. The blaze, fanned by a fifty mile gale, soon destroyed the vessel. Only two members of the crew were aboard and they escaped in a small boat.

The steamer Wm. Livingstone was badly battered in the storm on Lake Superior. The after deckhouse was smashed in by the seas and forward deckhouse badly flooded. It was feared that the fires might be put out, but the steamer was fortunately able to gain the shelter of Grand Island.

The schooner Allegheny was disabled at the Portage ship canal and her crew had an exciting experience before the tugs got her into shelter.

The whaleback steamer Pathfinder broke her wheel and was blown ashore at Harbor Beach.

The schooner Ford River with a crew of seven men was out in the gale forty-eight hours and reached Chicago waterlogged. She had a narrow escape from foundering.

The barge Thomas H. Cahoon broke away from the steamer Homer Warren in the gale on Lake Huron. It was supposed at first that she foundered, but later advices are that she is safe.

The tug Pinola operated by the Standard Contracting Co. was sunk near Bay bridge, Sandusky, during the storm.

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QUESTIONS FOR MASTERS AND MATES.—NO. 16.

235. What is meant by the magnetic circuit of a magnet?

236. How could you age a magnet by artificial means?

237. Why is it that two magnets of the same size and from the same bar of steel, will not have or retain the same amount of magnetism?

238. What is a molecule?

239. What is meant by specific gravity?

240. How many feet in a knot?

241. How many feet in a sea mile?

242. How many feet in a geographical mile?

243. What is meant by the mean nautical mile?

244. Is a nautical mile longer on the equator than at the poles? Why?

245. What should be the length between knots on the log line if a 20 second sand glass is used?

246. What is a sand glass and explain its use?

247. What is the buoyant effect of a cubic foot of water in pounds?

248. How much weight will a piece of iron having a volume of 1,728 inches lose when immersed in water?

249. How many fathoms in a mean nautical mile?

QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 17.

Give all principal shoals and landmarks passed on either hand. In taking true courses to make good its mean correct magnetic course, you should take the mean variation at ends of each course or direction.

171. How is St. Martin's Reef marked and what is the correct magnetic bearing and distance from Detour lighthouse?

172. Give all the principal shoals from Lake Huron lightship to Cove Island lighthouse on the east shore of Lake Huron.

173. How would you navigate a boat into Goderich Harbor?

174. How close would you pass Pt. Clark lighthouse bound up or down the east shore of Lake Huron?

175. How is Jenny Graham shoal marked and what is the true bearing and distance from the Great Duck lighthouse?

176. Where is Dougal's Rock and how is it marked?

177. Where are the magnetic reefs?

178. With Sand Beach main light bearing W½S at 8:15 a. m., steering correct magnetic course to bring to a point 2 miles ExN½N correct magnetic from Thunder Bay Island lighthouse, speed of boat from 8:15 a. m. to 11:30 a. m., being 11½ miles an hour and then 9½ miles per hour, balance of way, what time should boat be abreast of Thunder Bay Island lighthouse?

179. At 7:30 p. m. you had Presque Isle lighthouse bearing SW x W½W correct magnetic, distant 4 miles and steering correct magnetic to a point 1½ miles SE x S½S from Detour lighthouse, the weather set in foggy. Your boat is running 12 miles per hour. At 11:07 p. m. you suddenly hear Detour fog whistle apparently bearing W x N½N distant about 5 miles. What would you do in this case to navigate your boat with safety into Detour?

180. If you had Presque Isle lighthouse bearing WSW distant 3 miles bound for Lake Michigan, after shaping compass course from correct magnetic course on what hand would you expect to pick up Poe's reef lightship if you were taking South Passage?

QUESTIONS FOR OILERS AND WATERTENDERS.—NO. 12.

Question 86 in the oilers' and water tenders' course was incorrectly printed. It should read as follows:

86. How many cubic feet of water will be extracted by a bilge pump per hour, diameter of plunger 3 in. and 14 in. stroke, 50 revolutions per minute, the pump being ⅝ full each stroke?

121. Of the numerous devices on the market called "smoke consumers" do any actually accomplish same?

122. What would be the first thing you would suggest doing should you find a small crack in the crown sheet?

123. How would you plug a leaky tube?

124. Would you attempt to caulk a leaky seam with steam in the boiler?

125. Which needs the most care and constant attention the engine or the boilers, and why?

126. What precaution should be taken in opening or closing any kind of valve under steam pressure?

127. What is a check valve and what is its function?

128. What kind of a valve would you suggest placing between check valve and boiler and what precaution must be taken in regard to the valve?

129. In preparing to blow out a boiler for repairs or cleaning how would you proceed?

130. In cleaning tubes what method would you advise?

SOMETHING ABOUT TEMPERATURE.

The statement that red heat is about 300 degrees Fahrenheit should be 1140°, the heat of common fire. Heat of 300° has the effect of decreasing the magnetism in magnets very materially. Brass melts at 2233°; iron melts at 3470°.

AN EXCELLENT BOILER COMPOUND.

One of the most interesting exhibits at the recent traction men's convention at Columbus was that of the State Manufacturing Co., 36 Michigan avenue, Cleveland, makers of Metla-Cota. The exhibit was inspected by all of them closely, as Metla-Cota is invaluable in power houses and in all steam generating plants. As its name implies Metla-Cota is a boiler compound. As to the efficacy of this product there are endless testimonials. Ever since the utility of steam was discovered the treatment of the interior heating surfaces of boilers has been a perplexing one. Metla-Cota seems to have solved the problem well. It is put up in the form of paste and becomes a liquid upon the application of hot water. It differs from usual compounds in that it not only removes scale but coats the metal as well, preventing scale forming again. The time required for treating a boiler depends upon the age, condition and amount of scale forming in the water used. In the majority of cases results are noted in thirty days. Metla-Cota will not injure metal. It is absolutely harmless to iron, steel or brass and will not affect packing. James Bennett, chief engineer of the steamer Samuel Mitchell, relates that he tried the compound in the port boiler and found such an improvement that he immediately ordered a quantity for the starboard boiler as well.

Robert W. Hunt & Co., Rookery, Chicago, announce that they have engaged the services of Mr. Edward H. Lynde, who for years was connected with the Lackawanna Steel Co., in charge of the Bessemer steel rail department at Scranton, Pa. Mr. Lynde will assume direct charge of the departments of Robert W. Hunt & Co.'s business which were under the immediate direction of their late partner, Mr. Albert W. Fiero. Under the terms of the partnership Mr. Fiero's widow and children will continue to enjoy the interest in the business for the next three years.

The steamer John C. Howard which was built by the Columbia Iron Works, St. Claire, in 1903, has been sold by the Hall Coal Co., of Ogdensburg to the Dollar Steamship Co. of San Francisco. She will be docked and strengthened before she makes a trip around the Horn.

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THE EMBALMED DOG.

BY E. A. SUVERKROP.

It all came about through a series of unlucky circumstances, but as the finish up as far as money matters were concerned, was on the whole satisfactory to me, I have no kick coming.

I was second engineer of a tramp steamer, the Nelisco. When we got into the Mersey something went wrong with the windlass.

I was in the engine room at my post on the starting platform, working the engines into port, when the chief came below and took charge while I went forward onto the forecastle head to clear the windlass.

While I was busy trying to locate the trouble the carpenter starts the windlass, and a pinch-bar, which he had pushed through one of the anchor-chain links and forgotten, flew out and striking my leg, broke it.

When we made fast along side the quay I was put on a stretcher and carried up to the hospital.

After my leg was set and I was lying comfortably on my cot they sent word down to the skipper that I wouldn't be able to sail with the ship. So he came up and I signed off the ship's articles, the skipper, at my request giving me a note to the owners in New York for the money that was due me.

By the time I was out of the hospital the Nelisco was out on the Chinese coast, so my best course was to get back home to New York again. I had only a little money and was still weak from the long lie up, so off I went to the American consul who got me a sort of half-job-half charity position as assistant deck engineer on a big liner. I won't say which one, for fear there might be some inquiries from the customs people, and you know I have not sufficient regard for them to be willing to put them next to a good thing.

The chief engineer of the liner I had little to do with, he of course looked on me as a sort of pauper, down and out, and seemed to think he ought to give me a kick to help me along. Of course he was chief of a big liner and had his dignity to keep up, which he did with the aid of plenty of gold lace and a frigid pompous manner towards his immediate inferiors, so it's not to be wondered at that he treated me, whom he regarded as little better than a beachcomber, with a harshness and arrogance it was difficult for me, an American, to stomach. However, I had to be content to bottle my wrath, as I was really not fit to fight him in my weak condition, and I had further no desire to be put in irons or on a diet of bread and water in the ship's hospital, which you all know is used as a calaboose.

The work given to me was light. The second engineer put me to overhauling and cleaning some of the doctor's instruments which had gotten rusty through sea water getting at them.

As I had worked at the instrument business ashore, I understood the job all right, and with the aid of some fine crocus paper made a nice job of the rusty probes, scalpels and forceps.

After that job was done I overhauled the steering engine, and being a clever mechanic I won the respect of the engineers I came in contact with, from the second down.

On sailing day I had little to do, so I hung around on deck and watched the passengers coming on board.

While I was watching the saloon passengers come aboard, I was struck by the appearance of a slender girl, of maybe twenty, to judge by her figure and the way she handled herself.

She was dressed in a long gray dust coat and had a heavy veil on so that I could not see what her face was like, but when I did see it later I can assure you it was the most beautiful one I had ever seen. Sweet and innocent looking it was, and I fell plumb in love with her like a silly boy of sixteen.

The girl was very much excited about something or other and went direct to the captain about it. I couldn't hear what she was saying to the old man, but whatever it was, he wouldn't agree to it, and kept shaking his head in a most decided manner.

It was then that she raised her veil, and I fell in love with her, and it was also the last time the old man shook his head in the negative.

I'm not much of a hand at describing feminine charms, but when she pushed back her veil, raised her head and smiled it was the fairest sight I ever saw. Her mouth was like a split cherry with a twin row of pearls in the cleft.

So when she smiled and spoke with her veil up, the old man just turned to putty in her hands and began to nod like one of those silly Chinese idols you can buy for ten cents on the quay side at Shanghai.

Well the old man sings out for the mate, and up he comes and the minute he claps eyes on the girl he goes red and white by turns and his lips go dry with the fever in his blood, so that he has to lick his lips before he can say "Yes, sir," to what the skipper orders him to do. All of which was a sin and a shame, for he had a wife and a baker's dozen of brats living at Bootle on the outskirts of Liverpool.

So off he goes to the quay-side and five minutes later back he comes with a sort of a "personally conducted tour" consisting of four big stevedores carrying a crate, and in the crate was the biggest great Dane dog I ever set eyes on.

Instead of fetching the crate forward under the break of the forecastle (where dogs are generally stowed) it was brought up onto the promenade deck (which is strictly against rules) and was lashed fast to the railing that ran around the chart house.

"The woman's a witch," thinks I, when I sees the way she wound the poor skipper around her finger, and witch she surely was, for before we had been twenty-four hours at sea every man aboard (both passengers and crew) was crazy over her, and would run to execute her slightest wish.

Well, we cleared that afternoon and I didn't see anything more of the lady or the dog till next day and then only for a moment when I was sent to see why the whistle wouldn't blow. I found that the lanyard had got jammed around the lever, so I borrowed a ladder from Chips and cleared it.

When I had finished the job, I picked up my tools and started along the promenade deck on my way to the engine room store-room. On my way I had to pass the saloon smoke-room. Just as I was passing the smoke-room door I ran into a passenger who happened to be coming out in a great hurry.

I begged his pardon (although it wasn't my fault) but instead of accepting my apology like a gentleman, he broke out with a great torrent of abuse, and saying he'd report me to the old man. He was a big man, black bearded to the eyes, which had a nasty cast in them, you know the kind I mean, like a shark's, one of them would be looking at you while the other one was taking in the beauties of the horizon at an angle of ninety degrees.

I didn't answer back, but I didn't like his looks any the better and it flashed across my mind, "If I ever get a chance to get back at you, Mr. Whiskers, I'll not let it slip," and neither I did when the time came, as you will see.

The next day I was repacking the glands of the winch on the promenade deck near the big dog's crate when out comes "Sweetness" (that was the name I gave her to myself, and, though it wasn't half good enough for her, it was the only one I ever thought of her by.)

She came up and spoke to me while I worked. Not impudent or haughty like, nor yet familiar, but just as if she'd known me all her life. She had one of those sweet, low, yearney voices and she asked me all about myself and almost before I knew it I had told her all about my accident, and the fight with the Chinese pirates, and a dozen other

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things I wouldn't think of mentioning to an ordinary stranger.

But the yarn that pleased her most was the one about how we fooled the custom sharks with the rum in the donkey boiler at fresh wharf on the London river.

Her face lit up and she clapped her hands, as she thanked me for telling it to her.

While I was talking to her the dog was going on something scandalous and every minute or so she'd go over to the crate and put her hand through the bars for the great brute to mouth it.

While she was doing this along comes the old man; I'm sure now she saw him, and what she said was for *his* ears, and not for mine, but at the time I didn't think of anything except that she was talking to me.

Well, as I was saying, along comes the old man, and when he got within ear-shot she said to me, "Mr. Engineer, don't you think its bad for Berserk (that was the dog's name) to be so confined? Don't you think he ought to get some exercise?"

If she'd said, "Don't you think Berserk had better make his dinner off your leg?" I believe I would have answered, "why, certainly," and put it in his mouth for him to chew on.

So its little to be wondered at that I said the dog was just pining for exercise, and I was just making up a fine yarn for the occasion, about a great Dane dog I knew of having died from lack of exercise, when the old man butts in with:

"Of course Berserk needs exercise; it would be the height of cruelty to keep a fine dog like that cooped up like a bantam hen. Why don't you unlock the crate and let him out for a walk with you on deck?"

The words were no sooner out of the old man's mouth, than, with a "Thank you, captain," (and the way she dwelt on the word "Captain" you'd think she was saying *Rear Admiral* or *Archangel Gabriel* or any other exalted title that would sound pleasing to your ears) she opened the crate door and the great brute burst out, barking, romping up and down like you'll see elephants do when they go "musth" as the natives call it, in the teak yards at Chittagong. And by my word he was more like a calf elephant than a dog.

So he and his mistress romped up and down the deck, the exercise and the sharp sea air making her even prettier than she was before if that's possible. In consequence of this, it was little time I had for my work at the winch, with watching her.

We had made a fine passage of it with a smooth sea and a "fireman's fair wind" as we engineers call a light head breeze. The next day we expected to make port. I hadn't seen "Sweetness" for two whole days and as the work on all the other winches was done, I thought I'd just go up and look the one on the shelter deck over in case she might happen to be there.

Well, there she was pacing up and down arm in arm with the chief engineer and a pleasant smile and nod she gave me as I passed with my wrenches and a bit of three-eighths Tuck's packing in my hand for the valve spindle stuffing boxes.

As I saluted her I could see with the tail of my eye that the chief was not over pleased with her having taken notice of me.

It was little I cared what he thought and over I went to slack back the gland nuts and pretend to look at the packing (I had repacked the glands four days before and the winch had not been run since.) Well, as I was saying, they were pacing up and down the deck and a fine couple they made, for, although I didn't like him, he was a well set up, manly looking fellow. Backward and forward they went, from the chart house to the smoke room and back again to the chart house. All the time Berserk, the dog, was following at her heels, wagging his tail and well pleased with himself.

I had just set up the nuts on one of the glands and was standing, wrench in hand, looking at the pair of them, she was looking up into his face and he down into hers. They were near the door into the smoke room and Berserk, as if in anticipation of their being about to turn 'round and had gone a step or so in advance of her, when suddenly the smoke room door opened and Old Whiskers (that ran into me the second day out) steps out on the deck.

The moment the dog laid eyes on him he lets out a growl and peels his lips showing his great white tusks, till you'd think the whole of the skin of his head was going to roll back. With one spring he was in the air on his way to Whiskers' throat, but he never reached, as quick as a wink Whiskers reaches his hand into his pocket and whips out a pistol that looked like a double barreled shotgun sawed off short. There were two reports, blended into one, and the dog rolls over on the deck, gives a few spasmodic kicks and then lies still.

"Sweetness" lets out a scream that made my blood boil, and crying passionately drops on her knees on the deck beside the body of the poor dog, and I, hardly knowing what I was about, covers the distance in half a dozen steps and lands Mr. Whiskers a crack between the eyes that peeled the skin off and laid him out on the deck beside the dog. Mind you, I don't say he didn't do the right thing to shoot the dog, he did, and did it smart, but Berserk was Sweetness's dog and it was her I was thinking of. Kneeling there on the deck with her dainty lace handkerchief at the great gaping hole in his chest, it was a sight to make any man sorry for her and want to punish the cause of it.

Just then the chief speaks up, "Mr. Dudd, just pick the dog up and take him down to the dispensary, perhaps the doctor can do something for him."

So before you could say *beans* away I was with the carcass of the poor brute down to the dispensary.

Pills himself wasn't there but I sent one of the stewards to look for him after I got him to open the door with his pass key.

While I was waiting for the doctor in comes Sweetness. "Oh, Mr. Engineer, do you think he's dead?" says she.

"Yes, miss," says I, "he's dead, but don't you take on so about it."

By that time the doctor comes in and said the dog was dead and there was nothing for it but to bury him.

Here again she took on something terrible. "Oh, doctor, I can't think of you burying my poor puppy (a fine, full grown puppy he was) at sea. Don't you think you could do something to make the body keep so that I can take him home and bury him decently in Los Angeles?"

Well, the doctor was no more proof against her than the rest of us. So when she pleaded that settled it and he promised her he'd fix Berserk up so he'd keep a couple of weeks anyhow.

"It's all the more easy," said he, "as he's just freshly killed, I can make up a solution and pump it through his arteries and veins."

At least that was what I gathered from the words he used that I could understand.

After asking me to help him by getting the blood washed off the dog's coat, the doctor clears out to mix his embalming fluid.

Sweetness cleared out, too, as she said she couldn't bear to see her poor puppy lying there dead.

After I was through with washing the dog and was hanging around idle with the time heavy on my hands waiting for the doctor, I sees the case of instruments lying open on the seat locker.

I don't know what put it into my head, just nosiness, I suppose, but thinks I "that's an awful big wound, I wonder what kind of a bullet made it," so with that I reached for a pair of bullet for-

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ceps, the old-fashioned kind like a long pair of plyers with two little half round cups on the ends of the jaws, and began poking 'round in the wound till I feels something hard and gritty.

So I opened the forceps, gets a hold of the bullet and pulls it out, together with a hunk of flesh I had gripped along with it in the forceps. Just as I was busy pulling it out (it didn't come easy, as the flesh was tough) I hears the doctor coming and not wishing to be caught monkeying with his tools I drops bullet, flesh, forceps and all into the side pocket of my trousers.

The doctor comes in (just as I gets my jacket buttoned over the long handle of the bullet forceps) with a half a pail full of mummy juice; I fixed up the engine room syringe (the one we use for squirting oil on hot guides) into a force pump; the doctor opens an artery and we pump Berserk full of embalming fluid.

After that the doctor makes a small cut in the dog's belly and pushes in a lot of dry powder, that looked like dry pickle for a harness cask, and then he sews the hole up.

As soon as he was done with me, I makes excuse that I want to wash the blood and hair off my hands so that I could go and clean the bullet forceps and put it back before he should miss it.

When I got to the lavatory and looked in my pocket to see what the bullet was like I found the strangest looking one that ever mortal eyes looked on. It was a diamond as big as the end of my finger and I'm not famed for either small hands or feet.

Well, you could have knocked me down with a feather when I saw the sparkle of it after the blood was washed off, but I pocketed it, cleaned the forceps and took it back to the dispensary just as the doctor was directing Chips how to make a coffin for the embalmed body of the dog.

So the carpenter made a nice snug box for Berserk, and the next day we gets into port and tied up at the pier in time for all the passengers to go ashore.

The day following I was paid off the few dollars that were coming to me and away I went ashore to get what was due me from the owners of the Nelisco, as I had arranged with the skipper when I signed off in the hospital at Liverpool to get my money in New York.

The owners of the Nelisco treated me all right and after signing a law paper, they gave me three hundred dollars as compensation for having my leg broke by their fool carpenter.

I had a friend in the jewelry business in Yonkers, so I took a run up there to find out what my *bullet* was worth.

When he saw it he was all for knowing how I came by it. So I told him a fine yarn about having saved a swell from drowning in Pernambuco harbor and his having given me the diamond as a token of gratitude.

"I'll give you two thousand bucks for it on spec," says he, "but It's worth more than that, probably twenty-five hundred dollars would be a fair price. But here, take this card and go to Simons' on Maiden Lane and ask for Mr. Rubin, he knows more about diamonds than any man in the country, he used to be the customs expert."

So off I went down to the city again and up Maiden Lane till I came to Simons' store, where I went in and asked for Mr. Rubin.

He was out for a few minutes but would be back shortly and I could see him if I cared to wait.

I was sitting maybe a matter of ten minutes or so, turning over the yarn of the man I had saved in Pernambuco (which was true) and the diamond he gave me as a reward (which was not, as all he gave me was an English half crown and an address where he told me to call the next day. But when I went to look for him next day I found he had given me a false name and address, so, as my car fare cost me seventy cents, in our money, and a half crown is only sixty cents, I figured it cost me ten cents to save that man's life. If that was all the value he placed on it, I suppose I oughtn't to kick.)

I had just got the yarn fixed up to my liking when who should come in the front door but Whiskers, and at that moment a clerk says to me "that's Mr. Rubin."

So I stood up and started towards him. As soon as he laid eyes on me he turned dead white and sort of flops into a chair, and gasps out "what do you want with me? I never saw you before."

"Which last," says I, "is a damn lie, for it was me that peeled that strip of skin off your nose where the little brown scab is. But I am a man of peace and I came here to get a price on a diamond; here's the card of the man that sent me to you."

"Oh," says he, looking at the card I gave him and recovering his presence of mind, "this is from Mr. Jacobs, my very good friend Mr. Jacobs, let me see the diamond, Mr. Dudd."

I then pulled the wad of paper, I had the diamond rolled in, out of my pocket and unfolding it handed the diamond to him.

"That diamond," says he, speaking very slow and wrinkling his brows together till there was a big crease above his nose between his two shark's eyes, "that diamond was stolen, stolen from me."

"Maybe it did belong to you once, but it's mine now and I want you to price it fair and buy it for its full value, because I need the money to found a home for embalmed dogs that have died from precious stone in the bladder," says I, talking slow and sarcastic, "I feel sure the United States customs department would be interested in the scheme and that is why I came to you, an ex-customs expert, to see if I couldn't get your name on the list of patrons."

When he heard that, he knew he could not scare *me* about stolen diamonds, so after a bit of haggling he paid me twenty-six hundred dollars, and out I went and it was many a long day till I saw him again.

How many more diamonds had been shot into that dog I don't know, but I do know that it was one of the slickest smuggling tricks I ever run across.

The body of the dog went ashore with the captain and the mate and "Sweetness" as a guard of honor.

The captain explained the circumstances of his death to the customs inspector and I suspect, altho' I didn't see it, that "Sweetness" raised her veil at (what these magazine writers call) the psychological moment and Berserk was passed into the country duty free as "raw material."

CHARGE AGAINST LINE BOATS

That the line boats are too reckless in navigating the lakes, was the statement reiterated at Buffalo this week by the captain of an independent vessel-owner's steamer. He complains that a Lehigh Valley boat crowded him at the flats in attempting to pass a barge and her tow.

"One of the greatest dangers on the lakes today," he declared, "is where one of three boats going either way attempts to pass the others. The faster boat will always cause the one between to sheer into one of the other two. It is strange that the captains don't pay more attention to this feature of steamboating. The collision between the Linden and the City of Rome at the flats last season was caused by a faster boat passing the Rome and Linden. Other collisions will result the same way, particularly if the light draught line boats crowd the others which generally need all the water there is."

During a heavy fog recently the steamer Cherokee ran aground on the Canadian side of St. Clair river. Her tow, the Chippewa, ran into her stern, cutting through into her cabin down to the water's edge.

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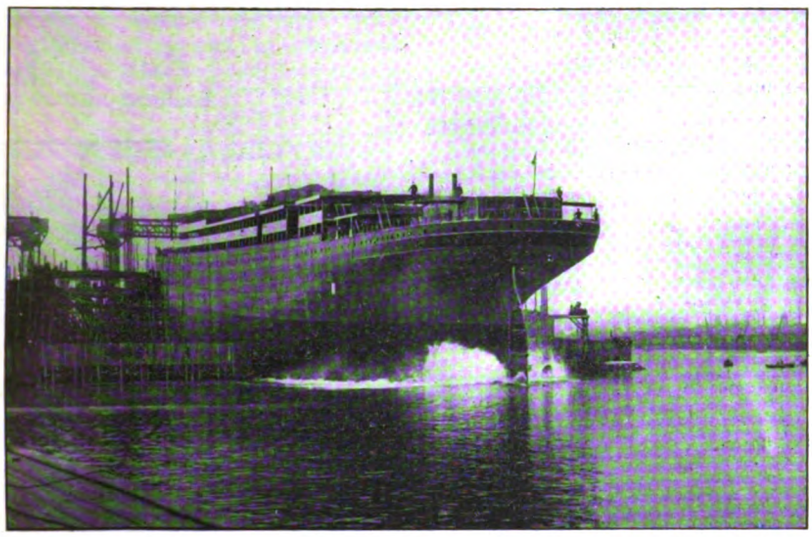
WHITE STAR LINER ADRIATIC.

This vessel, the construction of which has aroused so much interest, was successfully launched at Belfast on Thursday, Sept. 20. The launching weight was 16,780 tons and launching speed 12 knots. The Adriatic is a worthy successor of the many fine large steamers previously launched at Belfast for the White Star line, and will be an important addition to one of the finest fleets in the world. The Adriatic is 725 ft. 9 in. long, 75-ft. 6-in. beam, and about 50 ft. deep. Her gross tonnage will be about 25,000, and her displacement will exceed 40,000 tons. These figures speak for themselves, but as the vessel lay on the stocks, and subsequently at rest in the water, her beautiful model and graceful lines took away all appearance of heaviness, and it is evident to a practiced eye that, although so large, she is essentially a "handy"



LAUNCHING OF THE WHITE STAR LINER ADRIATIC.

vessel, her design combining the most approved scientific principles with commercial utility.

A noteworthy element of the vessel besides her size is that of strength. In addition to the general strength of the structure, the double bottom extending the whole length of the ship is a special element ensuring safety. The double-bottom is 5 ft. 1 in. deep, except under the engines, where it is 5 ft. 10 in., to give greater rigidity in the neighborhood of the machinery. The tanks or cells of the double-bottom will hold several thousands of tons of water, and the powerful pumps with which the ship will be equipped will enable these spaces to be filled or emptied of water in a very short time.

The Adriatic has nine steel decks. Her frames are composed of steel channel bars, and she has eleven watertight bulkheads subdividing the vessel into twelve watertight compartments. Many of the shell plates are over 30 ft. long and 5 ft. wide, and weigh between 3 and 4 tons. A large amount of the riveting throughout the hull has been done by hydraulic machines, the full-headed rivets thus driven affording visible evidence of strength as well as of the quality of the workmanship.

Having such large cargo-carrying capacity, the Adriatic will be fitted with winches and other loading and discharging arrangements of the latest and most efficient type. There will be large refrigerating chambers for the carriage of chilled beef, the machines for working same being on the CO_2 principle. There will also be an electric winch provided specially for the rapid and noiseless handling of baggage and stores, and on this ship another novel contrivance will be an electric elevator running from the saloon (or upper) deck to the upper promenade deck. A Marconi house with apparatus will be fitted on the upper promenade deck aft, and in addition the ship will be fitted with a submarine signaling apparatus which allows communication through the water at a distance of several miles.

Mr. Fred Pilon has been promoted to the superintendency of the Wyandotte yard of the American Ship Building Co., succeeding Mr. John McGonagle, who recently resigned on account of ill health.

James McCarthy, of Amherstburg, was shipped as mate of the steamer John Stanton last Sunday. He takes John Logan's place, the latter being promoted to a captain's berth on the City of Glasgow, Capt. Benham going on the new D. R. Hanna. Capt. Logan hails from Ashtabula, and was at one time shipping commissioner there.

NEW LAKE PACKAGE FREIGHTER EDMONTON.

The new steamer Edmonton, built by Stephensons at Hepburn-on-Tyne arrived in Toronto last Thursday on her maiden trip. The steamer, designed by John Gerell of Toronto, Ont., is of full canal size, 256 ft. long, 42 ft. 6 in. molded beam and 23 ft. deep. She is double decked and has complete waterbottom and is built under special survey to highest class of British corporation. The accommmodations for owners, captain and crew are unusually well fitted and fully of as high grade as any lake steamer afloat. She will load 73,000 bu. of wheat on 14 ft. draught and 115,000 bu. in the Green Bay trade.

She has six hatches in each deck, spaced 24 ft. centers, four of them 8 ft. long and two 16 ft. long to accommodate large package freight. Three gangways with watertight doors are fitted at sides. Steam windlass, capstan, steering engine and electric light outfit, two 4-ton winches and two 2-ton revolving cranes are fitted on spar deck. She is rigged with two short steel masts used as cargo derricks; main engines, 17, 28 and 46 in. by 33 in. triple, 185 lbs. steam, two boilers, 12 ft. diameter and 11 ft. long, natural draft surface condenser, ballast pumps, etc., complete speed on trial trip 12 miles on a draught of 12 ft.

On her trip across the Atlantic (from Hull to Quebec, 16 days), she carried 1,000 tons of cast iron pipe consigned to Port Arthur, and the captain testifies to excellent seagoing qualities. Nasty weather but dry decks. In workmanship and appointments she far exceeds any previous steamer built in the old country for Canadian package and bulk cargo trade, and was highly commented upon by Toronto ship owners.

The vessel is owned by the Mathews Steamship Co., of Toronto, and will alternate with their steamer Haddington in the trade between Fort William and Montreal.

It is reported that the Morse absorption of the Mallory line of steamships will result in two more contracts being awarded to the Newport News Ship Building & Dry Dock Co. The Mallory line has one ship building there at a cost of $1,000,000, and Mr. Morse is quoted as saying that he will add two similar vessels to the fleet. As the plans, designs and patterns are all at Newport News, officials are encouraged to look for two more large contracts.

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LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

KEEL AND CENTER KEELSON.

Fig. A. shows the center keelson plate marked ready for punching.

The rivet holes are obtained by means of molds made from the mold loft for the lap, vertical angles and top and bottom bars.

The plate is lined in on both edges to make sure of the width, then the frame spacing is put on as shown by vertical lines square to the sides. The butts can be made anywhere in the space between two rivet holes, care being taken to make sure that there is room for the lap butt. The plate butt rivet holes are marked with a mold D the top and bottom holes corresponding with the holes on the plate. This mold must be applied the same way throughout the center keelson in order to have the holes in the bottom angle agree as shown by the zigzag arrangement of the riveting. The rivet holes in the top angles are in a line and are so arranged that when the mold of the lap butt is turned over the holes will agree. The holes in the lap butt are all uniform and square to the butt of plate so that they will all agree with the exception of the bottom bar holes if the mold be turned over.

There can be no mistake in marking the center keelson plates if the process is gone through rightly.

When the lines are all put on the vertical angle, rivet holes are marked with mold F, the top and bottom rivet holes for angles coming right on the frame space line; a space mold is then used for marking the top and bottom bar holes. When all the holes are marked for the top and bottom angles the ends or butts of plate must measure the same distance from the last holes, only the rivet hole on the after end of the plate is in line with the lower row of rivet holes and the foremost hole in line with the upper row.

It will be clearly seen that all the mold holes must agree or something is wrong.

Fig. C shows keel plate, keel plate liner, top and bottom center keelson angles, channel floor, center keelson vertical angles, center keelson bracket and tank top angles, being all that can be seen in a cross section of the completed keel plate and center keelson.

The only change of riveting made on the center keelson is at the bulkheads which are watertight as shown by Fig. E. Mold M shows the arrangement of rivet holes in the center keelson and as these angles are 5″ x 5″ they are usually single.

The rivet coming inway of the keel of the frame is always riveted up before the floor and center keelson bracket is put in place.

The mold H is for the center keelson vertical angles; being of T shape, a right and left angle can be marked from same.

Fig. B shows a keel plate marked ready for punching. The rivet holes are all marked from molds made to suit the different pitch of rivets. The center line is put on as shown and the frame lines squared off from same. The mold K is applied to the frame line, a line being on the mold representing the center line which determines the position of frame mold. The seam mold 9 is then applied to the end frame holes and in this way the marking of the seams is completed. The butts of the keel plates are as a rule cut between two rivet holes and when the seam holes are all marked the butt of the plate must measure the same distance from the holes at both ends of the plates.

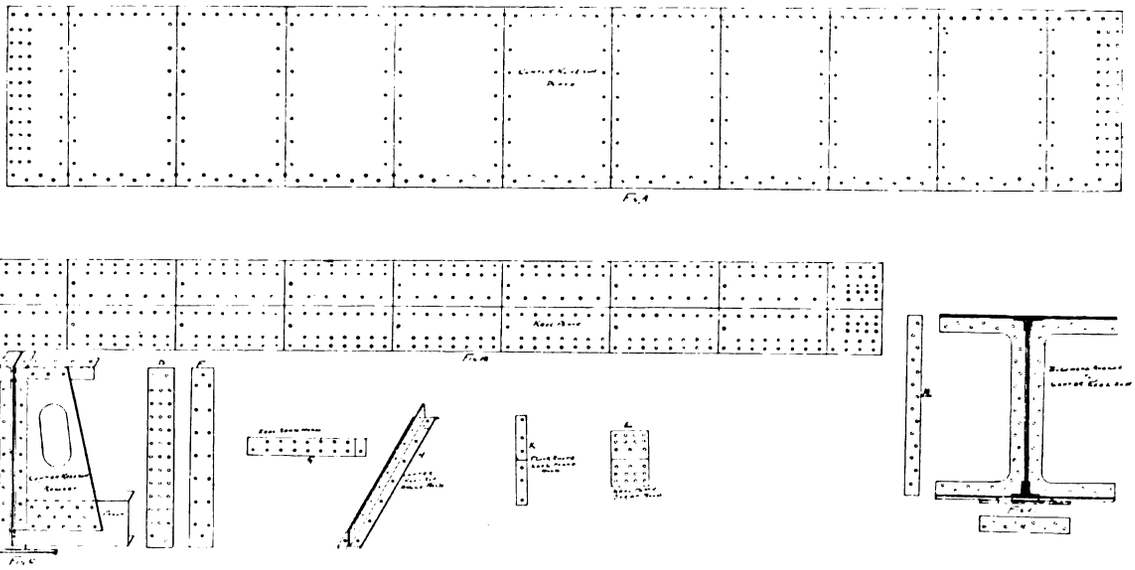
The lengths of the keel plates as well as the center keelson are measured from the batten for that purpose so that it is easy to detect an error if the holes at both ends don't measure the same distance from the ends of the plate.

The only change of the frame holes on the keel plate is at the bulkheads as shown by N Fig. E. The riveting for the bottom bars is arranged by applying the seam mold G on the watertight side of the center keelson, that is the outer row of holes is applied to the rivet hole which comes in line with the frame holes.

The other row of rivets is pitched eight diameters apart so that a space mold is made for that purpose and applied to the plate, the hole in line of the frame holes being a guide for same. L shows the mold used for the butt holes, this mold is also used for marking the straps with.

The bottom and top angles are marked with the same molds as are used for the keel and center keelson plates.

The frame spacing is put on the bars same as on the plates. The center keelson plate molds for the bottom will represent the standing flange of the bottom angles and the molds used for the rivet holes through the keel will be used for the flange to the keel plates. The top angles for the center keelson have a uniform pitch throughout on the keelson plate and one side of the tank which is watertight, the other side is 8 diameter pitch of rivets for connecting the tank top plating to the center keelson. The rivet holes on the flanges to the tank



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top come between the rivets through the center keelson plate and the holes for the bulkheads have only to be taken care of on the side not watertight.

The keel plate liners which are fitted between the keel plate butt straps and under the center keelson bottom angles are marked from molds, the holes for same being obtained from the strips which are used for marking the bar rivet holes in the keel plates. The same process is gone through for marking this class of keel and keelson plates in Scotland. The cost of doing this work in Scotland is very much higher.

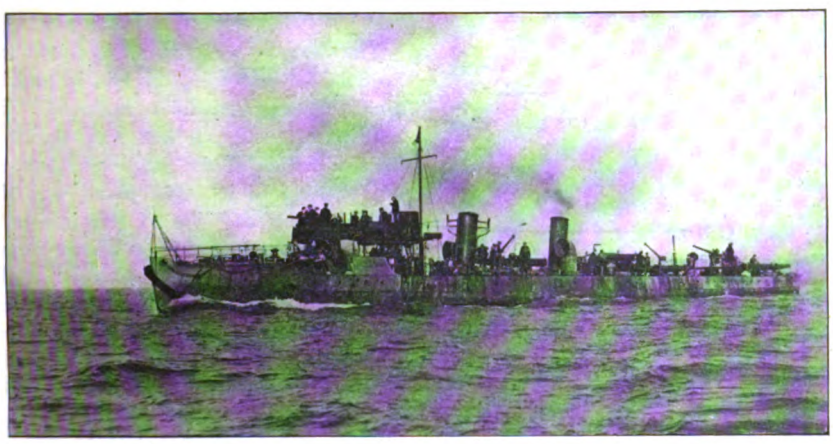
A keel plate 30 ft. x 30 in. by one in. thick would cost in Scotland $7.00 for, marking, punching, rolling and erecting in place.

The center keelson including top and bottom angles for each plate length $11.00. On the lakes in both cases the work can be done for 1-3 less.

The other parts, such as straps and liners can be done for one-third less in cost than in Scotland.

GADFLY'S OFFICIAL TRIAL.

On Sept. 27, 1906, a very successful full-speed official trial was carried out with H. M. S. Gadfly, the first of the new class of torpedo boat destroyers for the British navy. The vessel was built by Messrs. John I. Thornycroft & Co., at their Chiswick works, and is fitted



BRITISH COASTAL DESTROYER GADFLY TRAVELING AT HALF SPEED.

with Parsons turbines and Thornycroft water tube boilers, the latter being fired with oil fuel by means of the British admiralty oil fuel apparatus. Messrs. Thornycroft are also building four other boats of the same class, as part of last year's British naval program.

The vessel is 168 ft. long by 17-ft. 6-in. beam, with a maximum draught of about 6 ft. 6 in. The turbines are arranged to drive three shafts, half the power being on the central shaft and one-quarter on each of the wing shafts. The low-pressure and astern turbines are on the center shaft, and to it are also connected the cruising turbines for low speed.

The vessel was practically complete for handing over to the admiralty, including armament, and her load of 24 tons, representing stores, ammunition, etc., and carried sufficient oil, with some margin, for the eight hours' trial at the contract full speed of 26 knots.

The mean speed obtained during the eight hours' trial was 27.336 knots, the speed being estimated in the usual way from six runs on the measured mile at the Maplin Sands, taken during the fifth hour of the trial. The mean speed for the six runs was 27.505 knots.

The oil consumed during the trial was 22.6 tons, which works out at about 1½ lbs. per horsepower per hour. The steam was steadily maintained at the right pressure throughout the trial, and the revolutions gradually increased as the boat became lighter.

Further, there was no reason why the trial should not have been continued until the whole of the 40 tons capacity of the oil tanks was consumed. The admiralty are to be congratulated upon having devised such a successful method of burning oil fuel, and Messrs. Parsons on their turbines.

It was noted that during the trial there was practically no smoke, and the funnels were quite cool.

On the following day a series of steering and circle-turning trials was successfully carried out. The trials were also made of the capabilities for stopping, starting, and going astern, and these were found to be practically the same as with an ordinary single screw torpedo boat.

BRITISH COASTAL DESTROYER GADFLY GOING AT FULL SPEED.

The vessel was steamed astern for ¼ hour with the center propeller revolving at two-thirds the revolutions required for 26 knots.

A run over the measured mile showed a speed of about 12 knots. The vessel was afterwards run for one-quarter hour with the center shaft revolving at 699 revolutions, giving a speed of approximately 13 knots.

The vessel has also successfully carried out the twenty-four hours' consumption trial at cruising speed, gun trials, torpedo trials, etc., and has now returned to Chiswick for examination of machinery, and handing over to the admiralty.

NEW SAILING DIRECTIONS.

Special attention of mariners on the great lakes is called to the new "Sailing Directions for the Great Lakes" issued by the hydrographic office, of which No. 108A is now ready for issue, and 108B, 108C and 108D will be ready for issue on the opening of navigation in the spring of 1907. No. 108A has been completely rewritten on a totally different plan from the former issue, much additional matter introduced and is complete with the latest hydrographic information and exact condition of the improvements of every port and harbor on Lake Superior. In the appendix a practical method for compensating the compasses has been introduced which should be of much interest to navigators on the great lakes. These sailing directions are for sale by the MARINE REVIEW.

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COOPER SAND BLAST.

Affection for an inanimate object is a common thing, but a ship is so much a subject of life that affection for it is easily understood and is doubly common. There is a certain second mate on a modern lake steamer (name withheld owing to his exceeding modesty) who delights to act as caretaker for the vessel during the winter. Probably every vessel owner would like such a caretaker as he is, but such devotion is, however, rare. He lives aboard the ship during the winter months and not only scrapes and cleans her but paints

"THE MAN BEHIND THE GUN."

her inside and out during the long vigil.

For such a man the Cooper devices for cleaning and painting steel structures would be a great boon. These consist of a sand blast and spray device. Rust, as is known, is one of the enemies of steel and it is useless to paint a ship unless the rust is first removed. Sand blasts have been tried in the hulls of vessels and have proved quite successful. The Cooper sand blast apparatus is very simple. It requires no cumbersome sand tanks or other paraphernalia. The sand may be siphoned direct from the ground or from a pail or barrel and used over and over again. From 80 to 90 pounds straight air pressure is required. The device weighs only 5 lbs. and does the work effectively and rapidly. It has been adopted by the Union Iron Works, San Francisco.

The Cooper patent spray device is intended to apply Cooper preservative (first coat or primer for steel only) to steel structures. This device performs the work of ten men, treating round surfaces as well as flat, and reaching parts inaccessible to the brush. The preservative is guaranteed to give five years' durability to the last coat of any paint. Vessel owners are advised to write for this catalog, as the services are eminently practical and are extremely economical. The Cooper Sand Blast Co. is located in the Mutual Life building, Buffalo.

NEW DRY DOCK AT GALVESTON.

A new dry dock is to be built at once, the plans having been already prepared by the Duluth Engineering Co., W. B. Patton, manager, for R. P. Clark and associates of Galveston, Tex. The dock is to be located at Texas City, across the bay from Galveston, and will be entirely of concrete. It is to be 600 ft. long and 90 ft. wide and will have 19 ft. of water over the sill at low tide. It is not so large as many government docks, but will accommodate the ordinary boat of commerce and to facilitate the handling of smaller craft the dock will be equipped with a central gate separating it into two compartments which arrangement will save a great deal of time in pumping water out. The width of the gates will be 64 ft. For draining the dock two vertical centrifugal pumps will be installed, each with a capacity of 25,000 gallons per minute. With these pumps three and one-half hours will be required to empty the dock. For fire protection a 1,000-gallon force pump will be supplied and both the mechanical and pneumatic equipment of the dock will be of the latest patterns. The dock represents the beginning of what is intended to become a large ship yard.

The Truscott Boat Manufacturing Co., St. Joseph, Mich., received a cablegram last week from Milan to the effect that Truscott motors had been awarded a gold medal at the exposition there. The company's exhibit at Milan consisted of a four-cylinder, four-cycle 30 to 40 H. P. motor, and two-cylinder 8 to 12 H. P. of the same type; a single-cylinder, two-cycle, 9 H. P., and a single-cylinder, two-cycle 3 H. P. motor. The Truscott company has a very complete exhibition at the International Exposition which opened Nov. 1 at Christchurch, New Zealand. Truscott motor boats are used exclusively for carrying passengers at this exposition. These boats are the standard 25-ft. models built and equipped at St. Joseph and shipped in a completed condition to New Zealand.

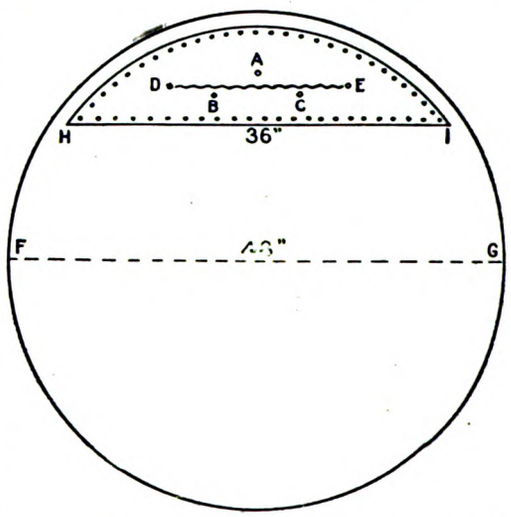
REPAIRING A CRACKED CYLINDER HEAD.

The following method for repairing a cracked cylinder head was recently forwarded by the engineer who did the work:

While the cylinder was hot a partial vacuum was created in it and Smooth-On Elastic Cement was painted over the crack. The vacuum drew the cement in and this operation was continued until the crack would take up no more cement.

Holes were then drilled and tapped at the end of the crack, D and E, and bolts put in to prevent a further extension of the crack.

The patch was cut as represented.



The crack was then painted with Smooth-On and the patch laid in position. Then it was carefully removed. The imprint of the crack was now shown on the under side of the patch—the Smooth-On sticking to it. The patch was then dished along the line of the imprint to make a recess to hold sufficient cement.

The plate was then warmed and a compound composed of Smooth-On Iron Cement No. 1 and Smooth-On Elastic Cement, mixed half and half, applied to the warm plate with a small trowel, making a thin even coating.

Then the patch was laid in position. The three center bolts, A, B and C, nearest the crack were brought up (just taut). Then the outside bolts were brought up tight, and lastly, the three center bolts were brought up as tight as possible, which forced the cement into the crack. Then steam was turned on and the crack was tight.

The Newport News Ship Building & Dry Dock Co. has just been awarded another contract by the Old Dominion Steamship Co., and will build a large freight vessel to cost about $700,000. The steamship company also sent the steamer Jefferson here to be lengthened.

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SMALL, VERTICAL, HIGH SPEED ENGINES.*

BY F. R. STILL, MEMBER DETROIT ENGINEERING SOCIETY.

Having had years of experience with various other makes of small engines, and comparing experiences of the past with those of the last three years, it has been found very difficult to avoid an almost exclusive reference to the one recently developed by an engineer associate of mine in the employ of the same company I am connected with—the American Blower Co., Detroit, Mich.

Therefore, it is hoped you will bear with me a little, if my enthusiasm has biased my judgment in your estimation. Constant association with people, places and things always brings about a different aspect to us than to others not so much accustomed to them, which may be my case, though I can't believe it.

To most people, a small engine is something to be avoided if possible. It generally requires constant attention, frequent adjustment, is extravagant in steam consumption, and is difficult to get at to adjust or repair

The main object of most manufacturers seems to be to see how cheap an engine can be built, not how good. This condition has so long prevailed that most people have concluded that it is impossible to build a small engine from which the same results can be obtained as from a large one. The troubles to which small engines are incident are commonly accepted as a necessary sequence to their operation.

Efforts have been made to mitigate these evils by various schemes in design and lubrication, but usually the designer became so wrapped up in the one particular feature which started him into the design, that he lost sight of the other and more important details, never after being within speaking distance of them.

For example, one designer may start out to overcome vertical vibration, having a notion that in a multi-cylinder, single-acting engine there is less tendency to this vibration than in a single-cylinder, double-acting engine. An idea comes to him that if he could get compression on the downward stroke so as to slow up the movement of the reciprocating parts before they reach the end of the stroke, the necessity for heavy counterweights would be removed and a smoother running engine would be the result. So he sets out to accomplish this one thing, and very likely thinks out some scheme by which to introduce air compression toward the end of the downward stroke. He becomes so fascinated with this idea that all other details are almost totally neglected.

It would be fruitless for any one to attempt to make him see that the same thing can be accomplished in a double-acting engine, with a properly designed valve, so as to get the right steam compression at the end of the stroke.

Another designer starts out to build an engine with some "freak" valve, and every other detail is worked around this one central idea, regardless of efficiency.

Several have tried to reduce lubrication troubles, principally by splash oiling, with more or less success. If an engine is always in one position and always runs at high speed, this system may give fairly satisfactory results, but it is unreliable on board ships and at slow speeds. Furthermore, it is extravagant in the quantity of oil consumed. These examples will serve to show the usual trend of effort for the improvement of small, vertical engines.

From experience and close observation it was decided that fully 80 per cent of the small engine troubles are due to improper lubrication; whereas only about 10 per cent are due to inadequate proportions and finish of the working parts, and the other 10 per cent to the neglect or ignorance of the operator.

It will thus be seen that if such conclusions are correct, the efforts of most of the designers have been in the wrong direction; that greater attention should be paid to proper lubrication and refining some of the details than to the production of something entirely new, with which there are likely to be as unsatisfactory results as before. Anything radically new is more likely to be misadjusted by the average engineer than something built on lines with which he is perfectly familiar.

Being so satisfied that these conclusions and deductions were correct it was decided to carry them into effect, if with no other result than to prove their fallacy.

To get away from any fixed notions, and to gain new ideas from the practice of others and, further, to give "an opportunity to criticise somebody else," an engine designer of long experience in some of the best shops in this country was engaged.

Before him were spread these ideas, also what he was expected to accomplish. This, briefly, was as follows:

1. An engine that could be sold with a guaranty that it would run three months or more without requiring any attention, either to the oiling system, or for adjustments, except the filling of the sight feed cylinder lubricator.

2. An engine that would be economical in the use of steam and oil.

3. That could be easily adjusted and not liable to easily get out of adjustment.

4. That could be used anywhere and for any purpose that an engine can be used for.

5. That had ample bearing and wearing surfaces to make it long lived and unlikely to overheat at full load.

6. That it should be constructed of the best materials for the purpose intended.

7. That it should be devoid of any semblance to "freaks" of every sort; and last, but not least, and, perhaps, the most difficult of all, it must not be so costly to build as to make the selling price prohibitive to the average buyer.

How well these requirements have been accomplished is shown by the satisfactory reports since obtained from the engineers having charge of them.

Being so thoroughly impressed with the importance of a good system of lubrication, the first step was to work out something more effective than previously used.

It does not take much thought to arrive at the conclusion that if metal does not run on metal, but is always separated by a heavy film of oil, there can be very little wear. The problem then settles down to the production of the necessary heavy film.

In looking over the many systems for lubricating engines, the most rational seemed to be forced lubrication by means of a pump. But experience shows this has many defects. The oil being under pressure necessitates extreme care in adjustment, as any bearing being looser than another vents the entire system and destroys the desired effect. Again, any foreign material that may get into the small tubes or grooves, which are an essential part of this system, will be rammed in tight by the oil pressure.

To overcome these objections it was decided to adopt a gravity flow, the oil being lifted by a pump to the top of the frame, from which elevation it would flow downward by gravity. In this way large tubes can be used; the velocity of the oil will be rapid, the volume of oil in circulation will be much greater, it will not be necessary to have the bearings tight, neither will they all have to be adjusted exactly alike, and any foreign matter will be washed out, instead of being rammed in.

Being satisfied that this came close to the ideal way of producing the flow of oil, the next step was to distribute the oil along the bearing and wearing surfaces to completely separate them by that all-essential film.

For ages it has been common to groove the upper or lower half of the journal box or perhaps both. There are as many ideas on the proper way to groove

*From the *Journal of the Association of Engineering Societies.*

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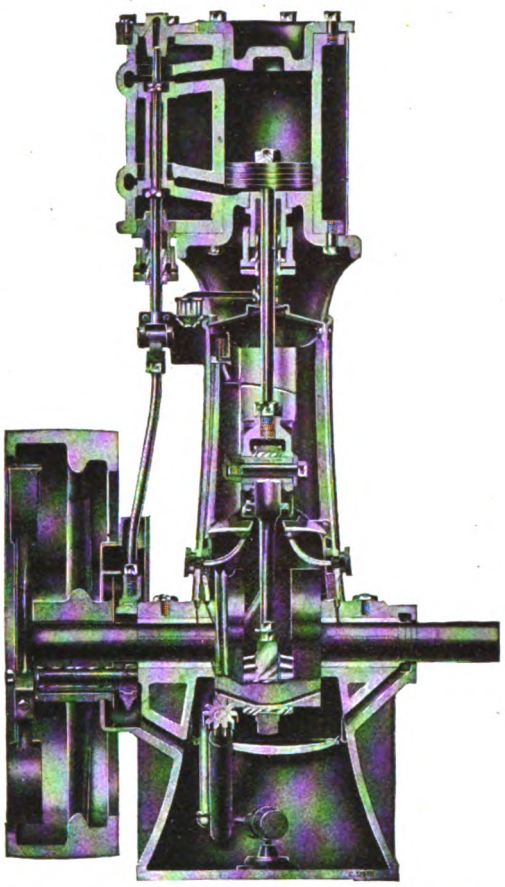
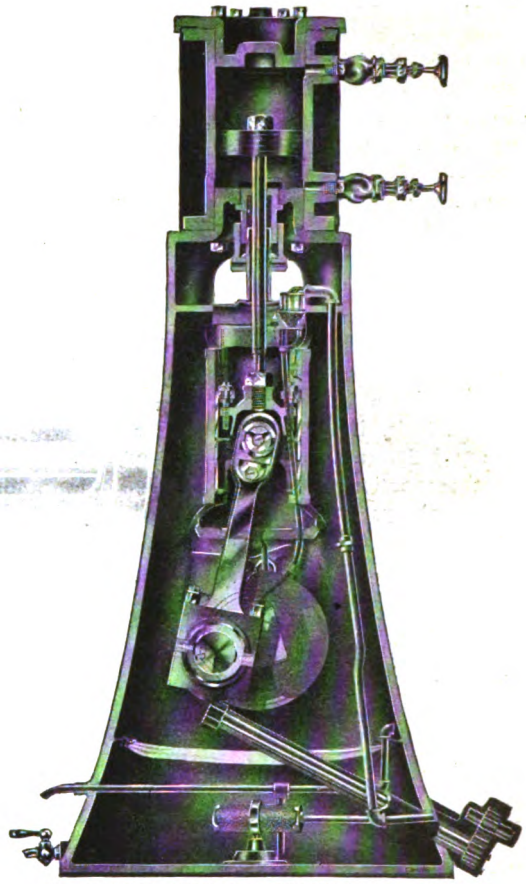
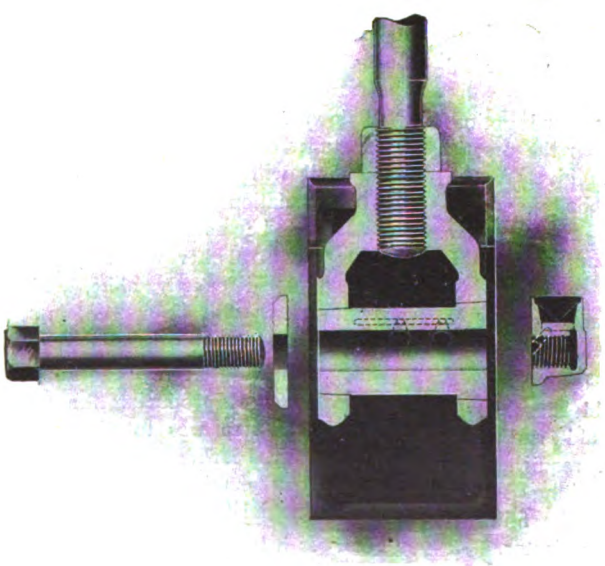


LONGITUDINAL SECTION THROUGH THE ENGINE.

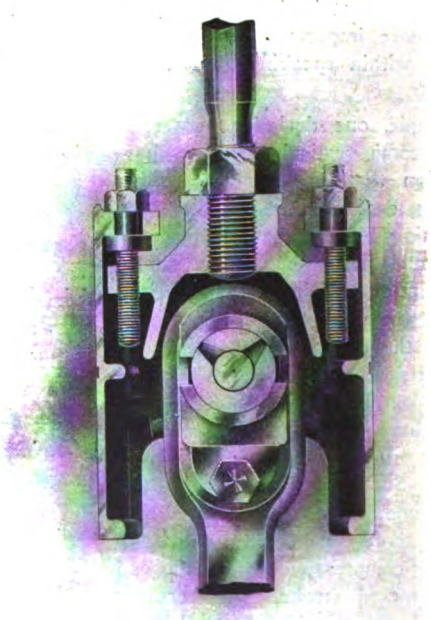


TRANSVERSE SECTION THROUGH THE ENGINE.

CONNECTING ROD BOLT.



CROSSHEAD.



CROSSHEAD.

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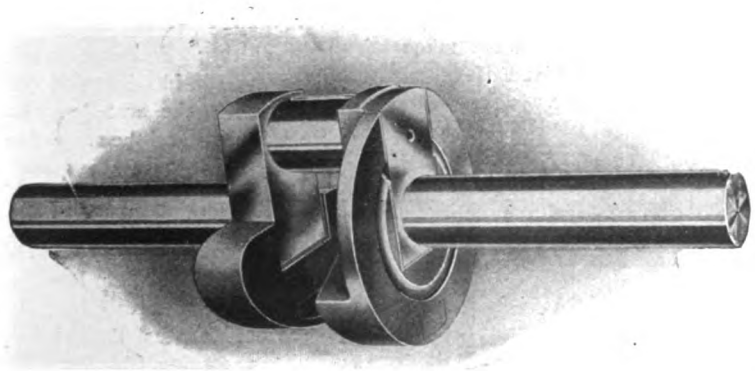
a box as there are people in the business, and there are evidently many more who have no ideas at all, judging from the way it is sometimes done.

Considering the question from a mechanical standpoint, it is at once apparent that an oil film takes up space, so a bearing cannot be tight or the oil can-



CRANK SHAFT.

not get in unless it is forced in at a pressure greater than is exerted on the journal.

The thicker the film, the more space there must be between the metals, hence a loose bearing is desirable of it does not cause pounding.

When the crank is on the downward stroke, it pushes the journal away from the upper part of the bearing. The shaft is also rolling in the direction the

CONNECTING ROD.

crank is traveling. Hence, the oil should enter at the beginning of the gap which intervenes between the shaft and bearing and thence be rolled up into the remaining space by the rotation of the shaft. The gap naturally begins at one side of the circumference of the shaft, so the oil grooves should most naturally be on the sides.

After the crank passes the lower center on the up stroke, oil should flow in from the groove on the opposite side in the same way. These grooves can thus be made large, say from ¼ in. to ⅜ in. in width and the whole length of the bearing metal.

The same scheme is applicable to the oiling of the main bearings, crank pin, crosshead pin, eccentric and governor weight pin, and it works to perfection, better even than was ever thought possible.

To gain some idea of the way it is working, it may be in order to point out a few cases.

Cards were sent to nearly all the purchasers of these engines asking them to have their engineer answer the questions printed thereon. The questions were as follows:

Size of engine?

When installed?

Revolutions per minute?

Steam pressure?

How often has oil been added since starting?

Quantity of oil added each time?

How often have adjustments been made?

Where have adjustments been made?

Replies were received in nearly every instance, and with the exception of five or six, they all ran over five months without any adjustments or additional oil.

One most exceptional case was at Davenport, Ia., where a 14 by 7 in. low pressure engine is running in a school building. The speed is 180 revolutions per minute, the steam pressure 40 lbs. At the start 4.5 gal. of oil was poured into the base and in two years only one gallon has been added and one adjustment made, which was to the crosshead pin.

In New Orleans an induced draft fan was installed on an ocean tug, which is driven by a 5 by 5 direct-connected engine. The steam pressure is 110 lbs. The engine runs about 360 revolutions per minute. The outfit was installed in February, 1904, and up to Nov. 29, 1905, about twenty-two months, only three gallons of oil had been put into the engine and one adjustment made to the crank pin. This engine runs continuously, 24 hours per day for three or four days at a time. It is seldom that it ever stops entirely, as it is turning over slowly even when the tug is tied to a dock. It is located in a very hot place over the boiler and withal is operated under about the worst possible conditions.

At the plant of the Trexler Lumber Co., Allentown, Pa., is another engine driving a blower which is attached to a dry kiln. This was installed Feb. 5, 1905, and up to Nov. 18, 1905, only one gallon of oil had been added and one adjustment made to both the crank and crosshead pins.

This engine runs steadily at 285 revolutions per minute, 24 hours per day, without stop for Sundays or any other day.

These few citations are sufficient to show the remarkable effectiveness of the oiling system.

There were many other problems in the perfection of this system which had to be worked out, that were, perhaps equally as interesting in connection with this oiling system. For instance:

After the oil has performed its usual functions it must be filtered, cooled and the water separated from it. Any of the usual methods of filtration were found unreliable, as they all allow pieces of lint or grit to pass through. After much experimenting it was found that a plain, closely-woven cloth suspended by four hooks from each corner of the frame, hanging just below the crank and above the oil in the base, gave the best results. All the oil dripping down from above lodges on this cloth and passes through to the reservoir below. Any foreign matter is left on top and has no tendency to leave the upper surface. Simple as it is, it has been surprisingly effective. As an extra safeguard a fine copper wire screen of ample area was attached to the pump suction and another to the discharge, both being easily removable for cleaning.

Another source of possible trouble which had to be guarded against is the loosening of core sand from the frame. No matter how much care may be exercised in cleaning a casting, some sand is sure to stick for a while, loosen later and cause serious trouble.

To prevent this the frame is painted inside with two coats of thick white enamel. It took a lot of experimenting to get an enamel that would stand the heat, moisture and oil without softening, but it was finally procured.

The pump first adopted was of the plunger type, actuated by an eccentric on the shaft. It was thought too complicated, however, and was abandoned for a gear pump. On the shaft is a large bronze worm with coarse teeth into which meshes a small spur gear

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attached to a shaft supported at an angle of about 45 degrees. The pump gears are within a case attached to the outside of the frame, close to the bottom of the base, where they can be gotten at at any time.

The discharge pipe from the pump is 0.75 in. diameter, and extends up inside of the frame to the top, where it discharges through a sight feed glass, so the engineer can easily see if the oil is flowing properly.

The oil then empties through a wire screen into a small tray, through the bottom of which latter project the various oil tubes nearly to the top of same. Each tube has a fine slit cut down the side of it to the bottom of the tray, so as to equalize the flow of oil into them all.

In adjusting the engine for this system no bearing should be so tight as to make it impossible to easily slide the connecting rod or shaft along parallel with its axis.

The success attained with these engines, while largely due to the perfection of the oiling system, could not have been attained if it alone had been the only thing carefully developed.

First of, all, good material of the proper kind has to be used, and all the pins, rods, shaft, piston, valve, crosshead shoes, etc., must be ground on centers to a true diameter and smooth finish.

The shaft is a forging with suitable counterweights fastened on.

The conecting rod is a drop forging finished bright.

The crosshead is cast steel, having brass shoes, wedge shaped and adjustable at the top and secured with lock nuts.

The crosshead pin is a special composition of a very fine grain and hard enough to take on a very smooth finish. This pin in combination with the brass used will not cut. The brasses have been set up as tight as they could be driven on a dry pin and the engine run all day without the least sign of cutting.

The piston rings are roughed out, cut, drawn together and clamped. They are then ground to the cylinder diameter. The crank pin brasses are lined with the best quality of Babbitt metal, peened in and scraped to a perfect surface. Adjustment to these brasses is accomplished by two tap bolts turned out of hexagon steel, threaded on the lower ends. Above the nuts the tops of the bolts are turned down to a smaller diameter and threaded again for a lock nut. The two tops are joined together by a yoke-shaped washer which is between the nut and lock nut to prevent either of the bolts working out if one of the lock nuts should loosen.

The fly wheel is so designed that the greater part of the weight comes in a plane close to the end of the bearing, thereby relieving to a great extent any strain on the shaft. The inclosing panels are held in place by a single milled thumb screw, thus overcoming the necessity for taking out a dozen or more screws to get off the cover plates.

Every engine is set up, given a day's run under full load, and then taken down, carefully inspected, and if found in a satisfactory condition is reassembled, indicated and adjusted before leaving the shop.

Due to the high speed, small clearance and a well fitting valve and piston the steam consumption has been brought down to an average of less than 37 lbs. per H. P.-hour for a 6 by 6 engine, with 100 lbs. pressure, when running 500 revolutions per minute with full load.

It is rare that the same economy is attained with other engines of the same size, as most of them take from 60 to 80 lbs. per H. P.-hour.

It really seems as though about all has been accomplished in the design of these engines that can reasonably be expected in any engine.

They are machines, and as such are not "fool proof," but they can carry a heavy load, run at high speed, do with less attention and still perform their duty better than can the majority of engines.

TRADE NOTES.

The General Specialty Co., 101-107 Seneca street, Buffalo, has lately put out a catalog descriptive of the Demon water-tube cleaner and the Torpedo fire-tube cleaner. The Demon is a rotary water-driven cleaner of immense power. The pressure of the water is applied directly upon rotary pistons, all other water-driven cleaners using the turbine principle having a jet of water striking the blades of the turbine wheel obliquely. With a turbine there is a constant escape of water, but in the Demon the water must rotate the motor before it can exhaust. The cutters are adjusted to the inside diameter of the clean tube which means that no scale can be passed over by a careless operator. The Demon refuses to advance through the tube unless all the scale has been removed as it goes along. The Demon cleaner can remove any thickness of scale. It is sent free on trial anywhere. The Torpedo fire-tube cleaner is an ingenious little instrument. Connected with the steam or compressed air supply, and put into a tube, the little machine strikes at the rate of 11,000 oscillations a minute. The torpedo works on the vibration principle of short strokes never over 3/8 in. and very light raps that are as harmless to the tube as the vibrator is to an electric bell. Brittle scale, however, cannot resist over 11,000 vibrations a minute. Vessel owners would do well to write to the General Specialty Co. for their circular.

The Whiting Foundry Equipment Co., Harvey, Ill., has just put out catalogs 47 and 48, the first descriptive of Whiting ladles and the second of Solenoid brakes. Both catalogs are excellent specimens of workmanship and go thoroughly into the subjects with which they deal. The catalogs are nicely punched for filing and will be sent to anyone interested.

The United States Steel Piling Co., 135 Adams street, Chicago, Ill., has recently issued a little catalog descriptive of the steel sheet piling which they introduced last year and which has since that time created quite a revolution in construction methods. In its adaptability it covers a wide field, as a glance at the catalog will quickly convey. Steel sheet piling was first used in February, 1905, on a cofferdam on the Arkansas river at Prowers, Col., by the Arkansas Valley Sugar Beet & Irrigated Land Co. It was employed in connection with a reinforced concrete diversion weir. The great advantage of this form of piling is that there are no bolts, rivets, or other additional parts to become loose, damaged, destroyed or lost. Each pile is uniform in strength, interlocking, interchangeable and complete in itself and all sections are interchangeable one with another. The catalog illustrates the various uses to which this piling can be put, containing not only good photographs, but excellent line drawings of sectional views. It is now in use all over the world for walls, sewer and trench work, caissons for building foundations, cofferdams, abutments and all sorts of construction work.

The H. E. Boucher Mfg. Co., 105 Maiden Lane, New York, has just put out a catalog devoted to marine models. It contains photographic views of excellent models of the battleship Connecticut, armored cruiser Tennessee, torpedo boat destroyer Decatur, army transport Sherman, passenger steamer Hendrick Hudson and steam yacht Endymion, together with testimonials from the navy department on the completeness and beauty of the models. This catalog is well worth writing for.

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THE MARINE REVIEW

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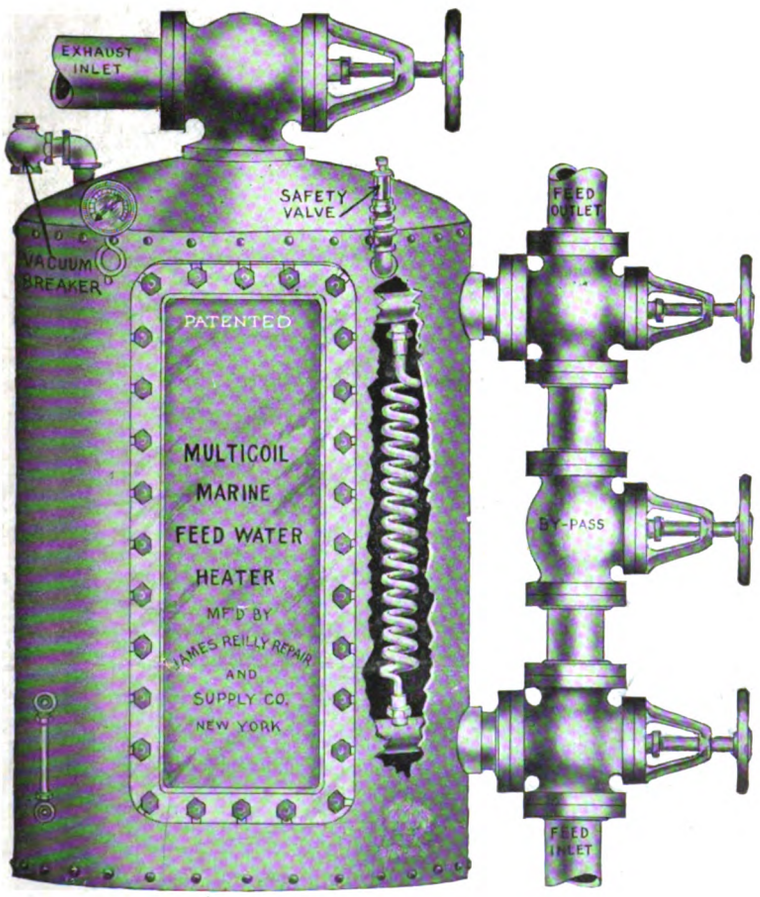

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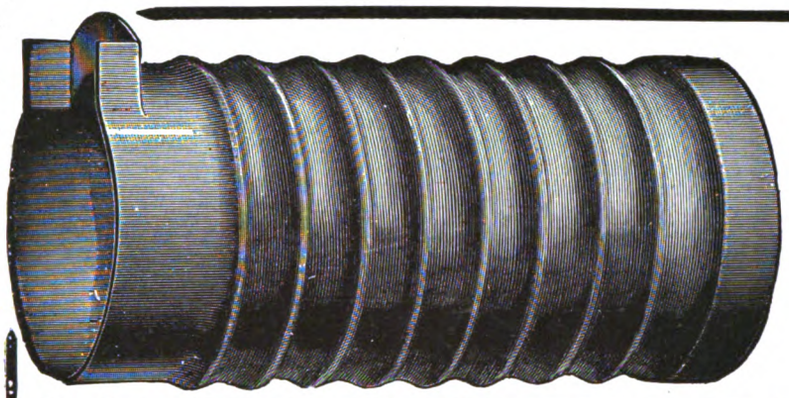

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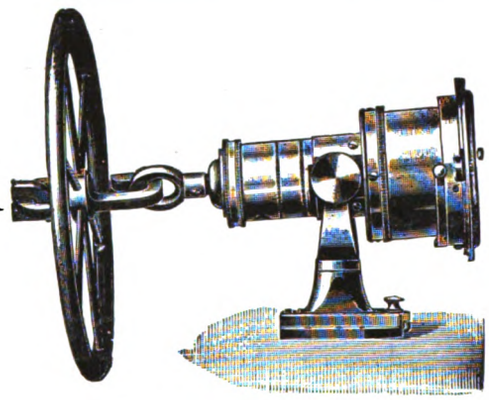

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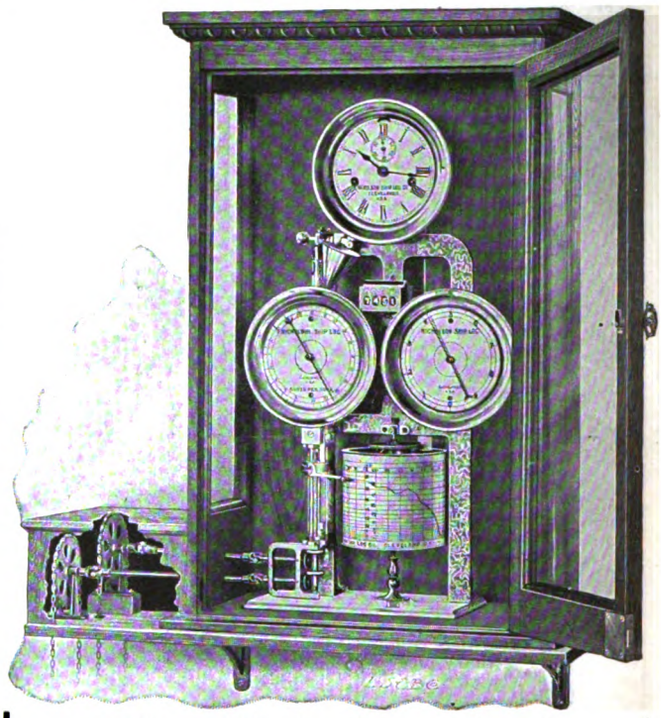

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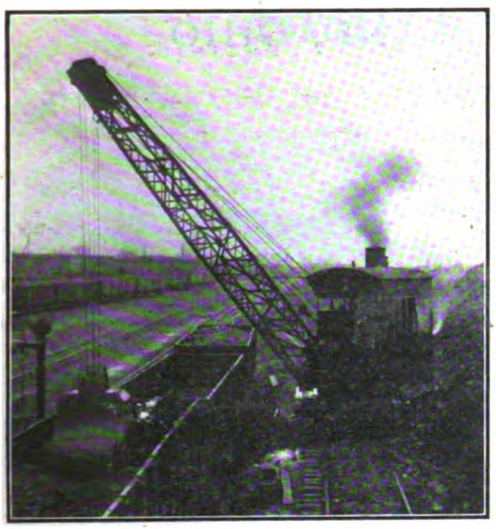

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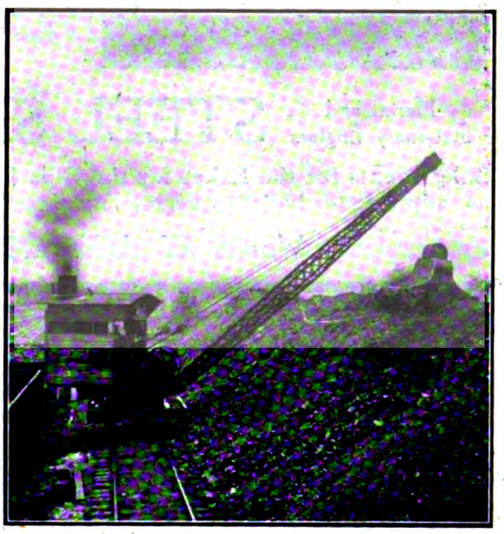

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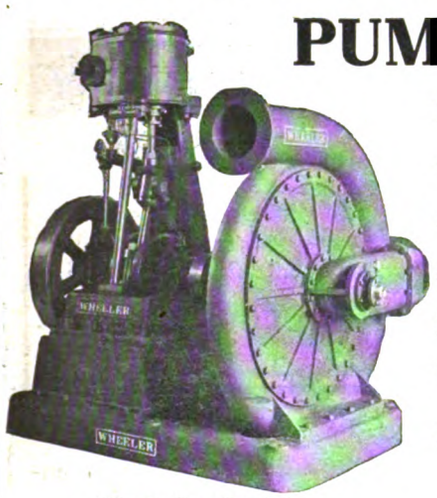

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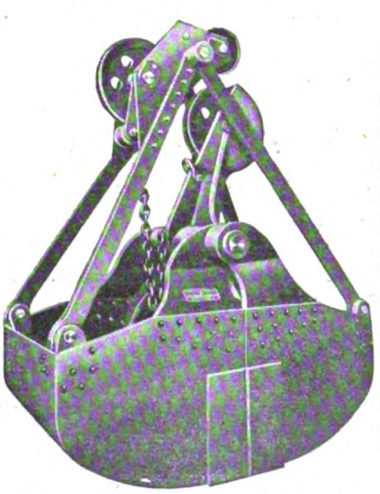

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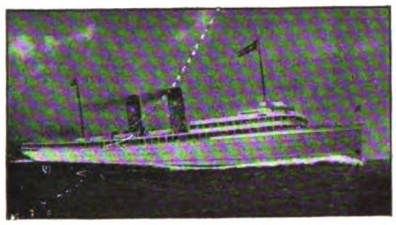

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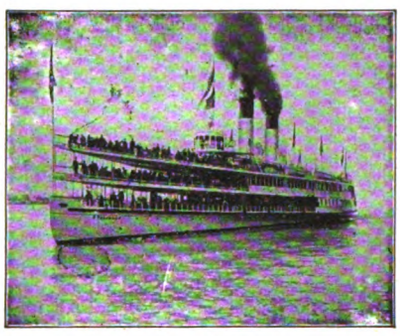

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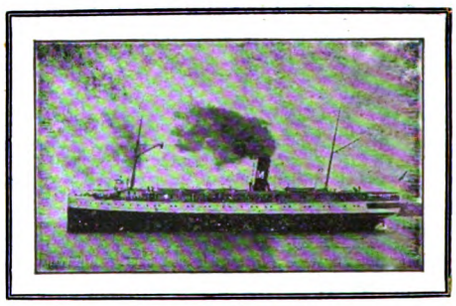

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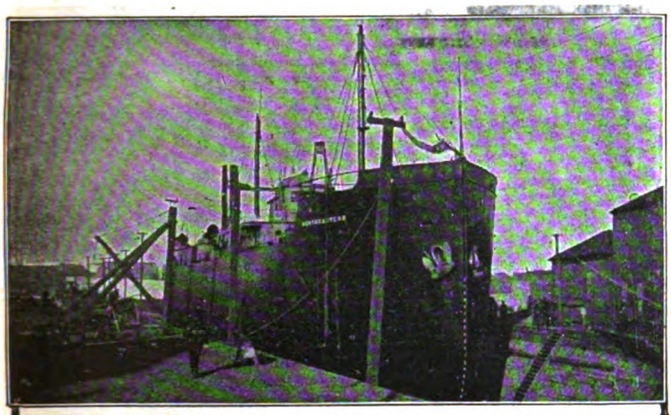

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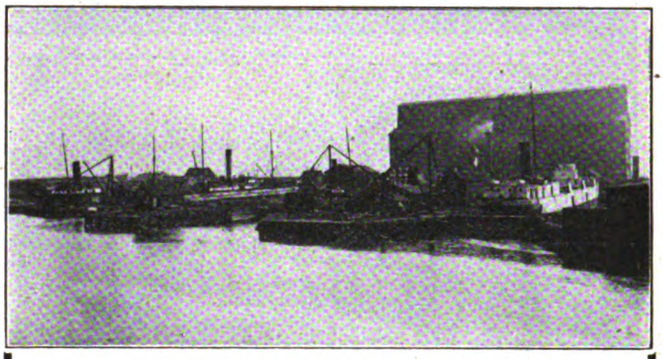

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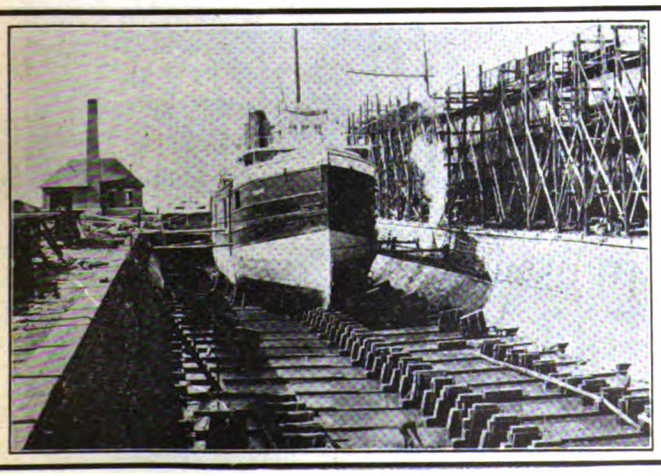

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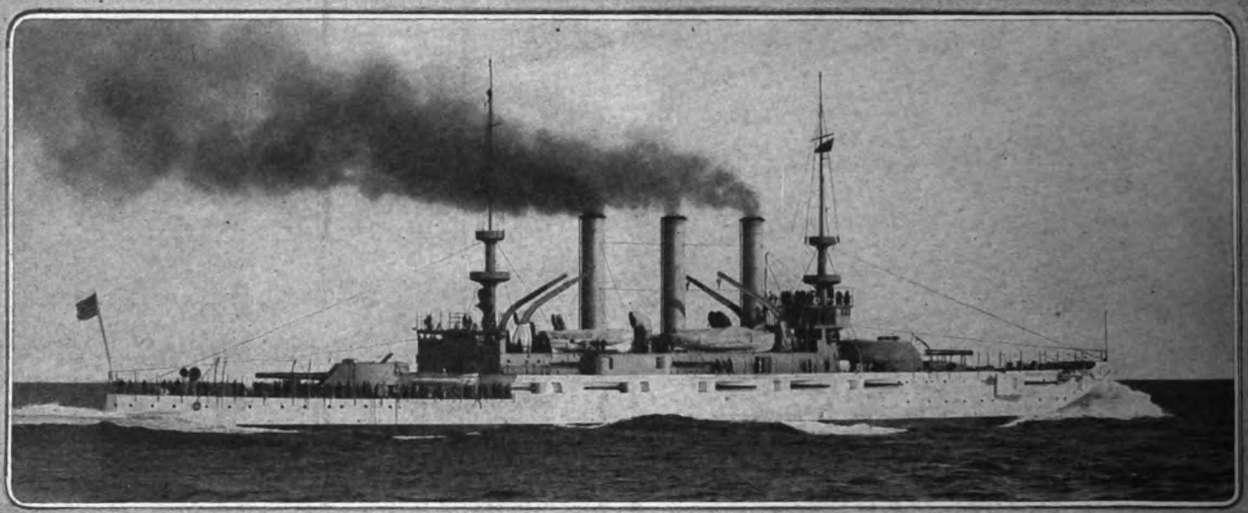

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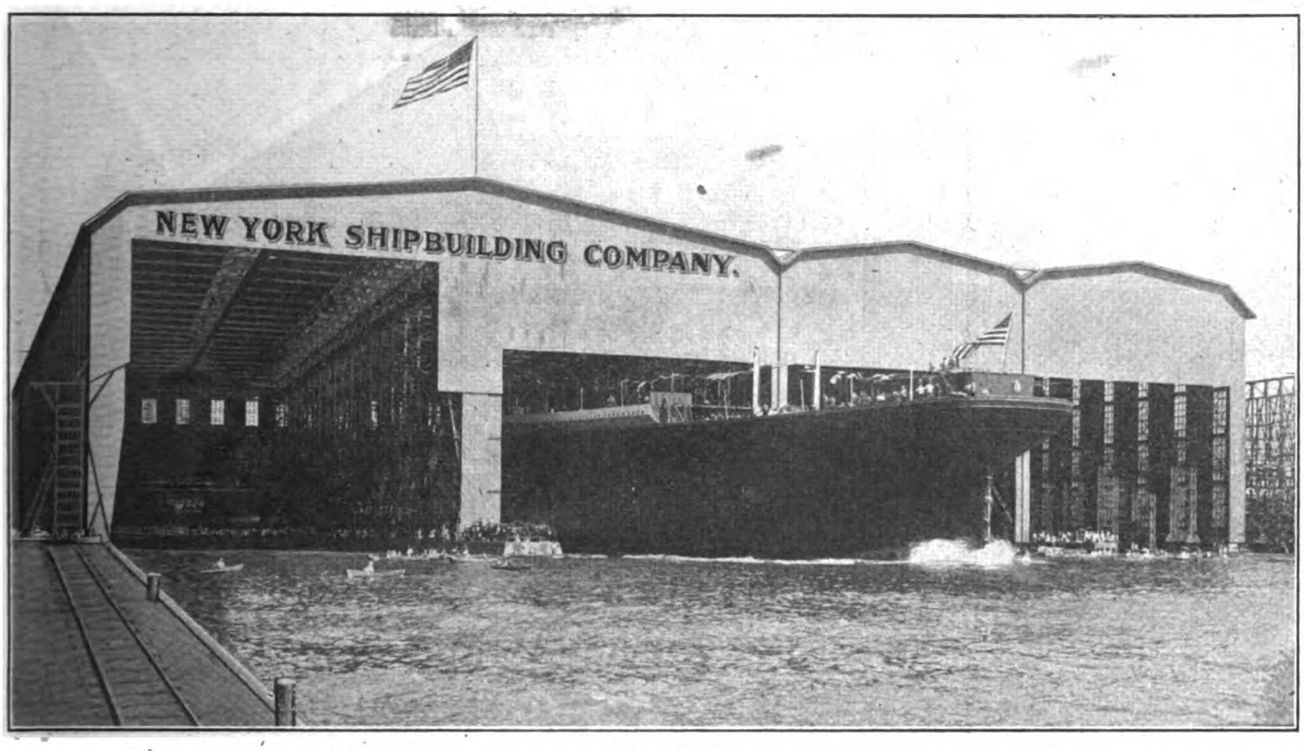

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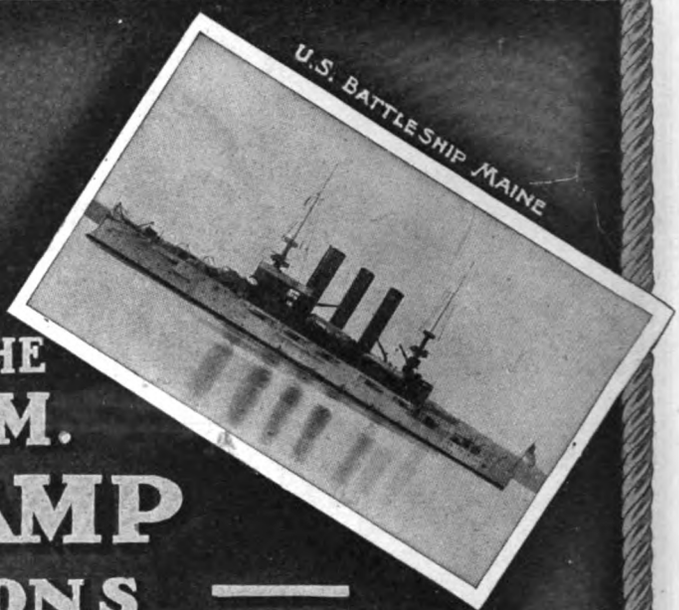

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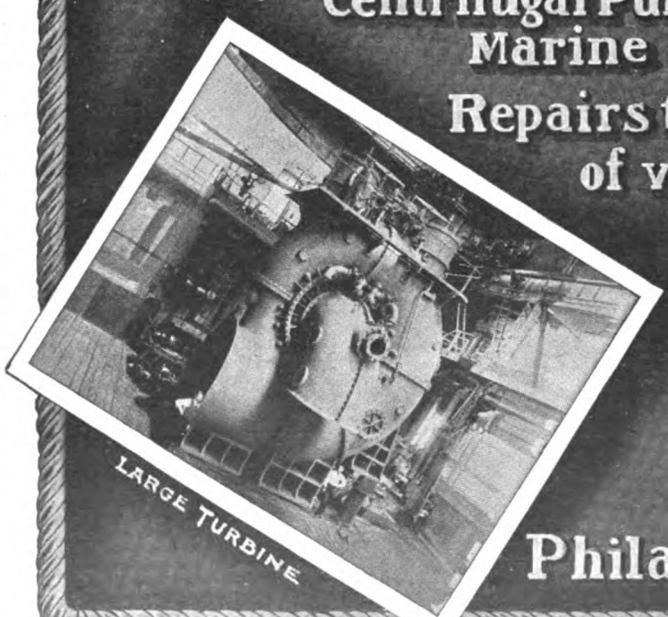

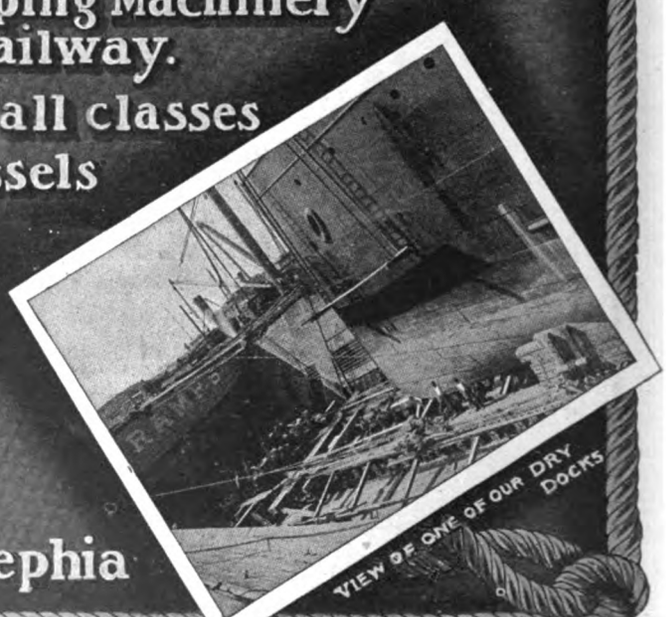

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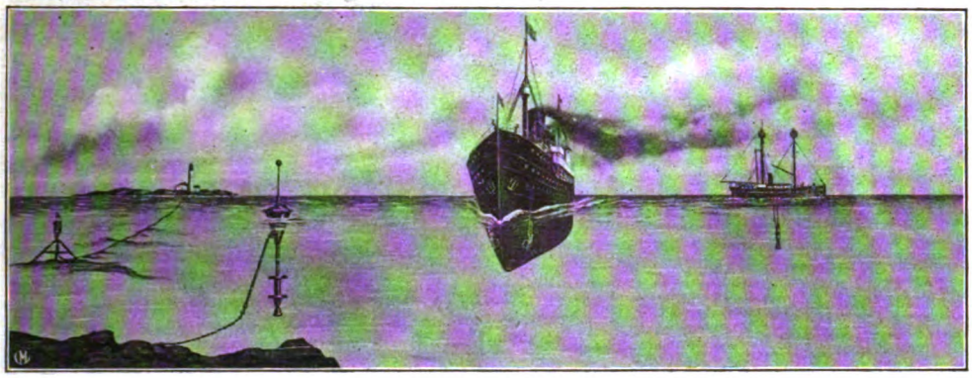

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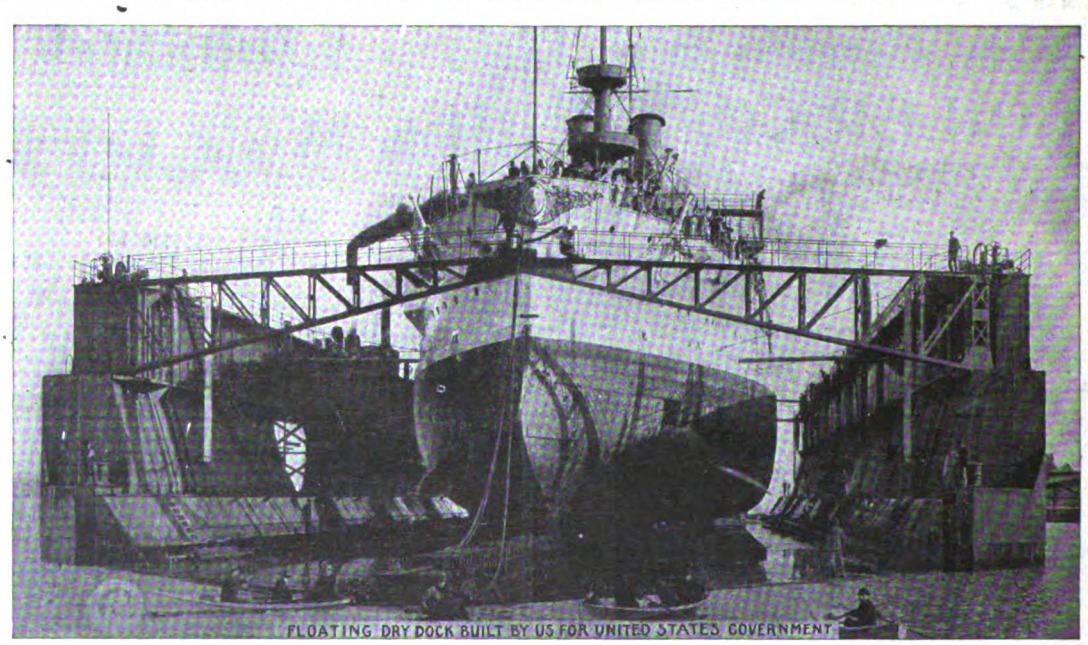

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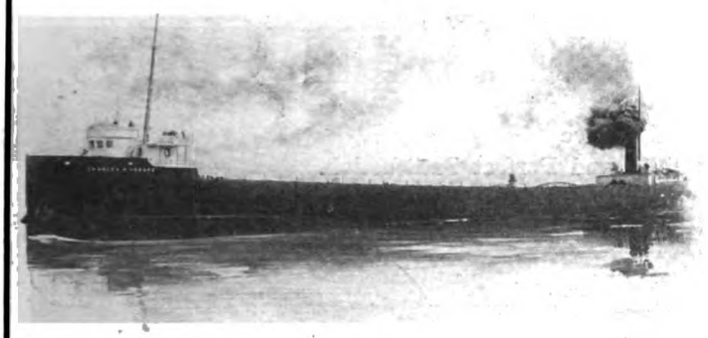

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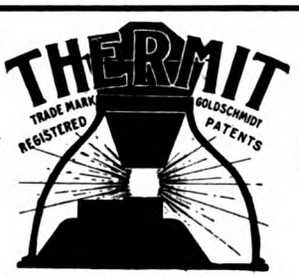

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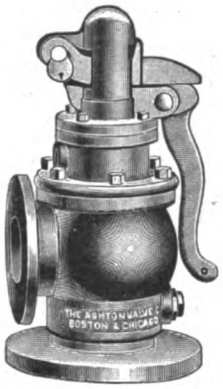

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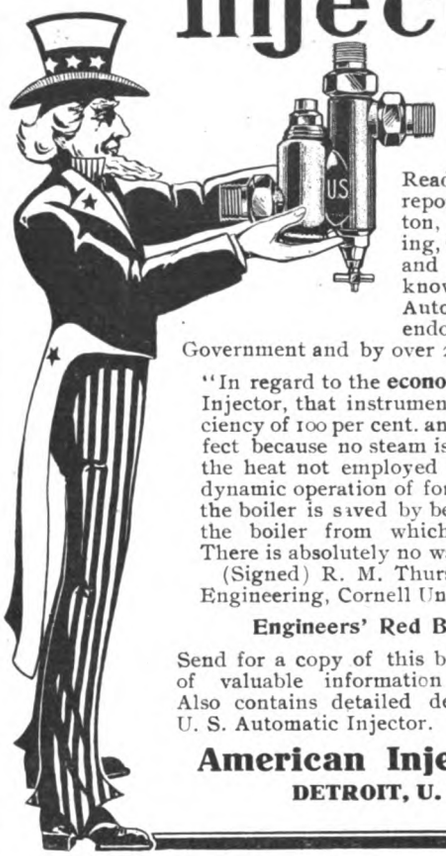

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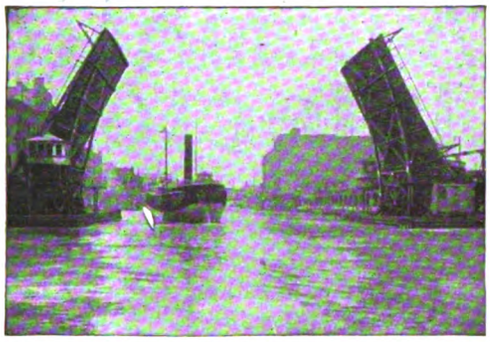

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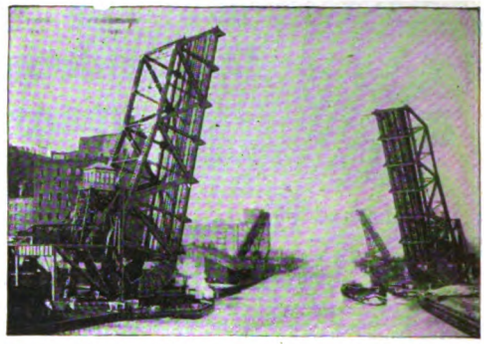

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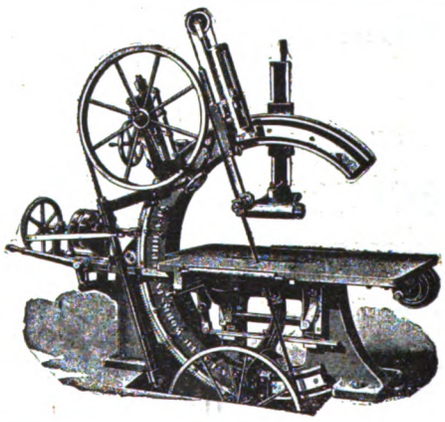

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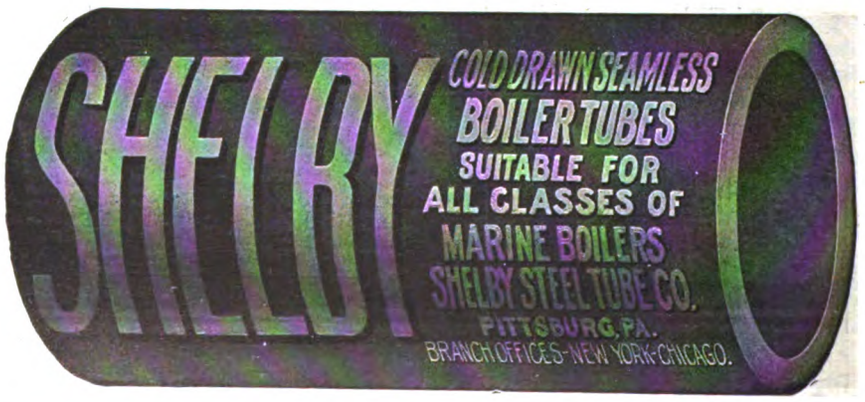

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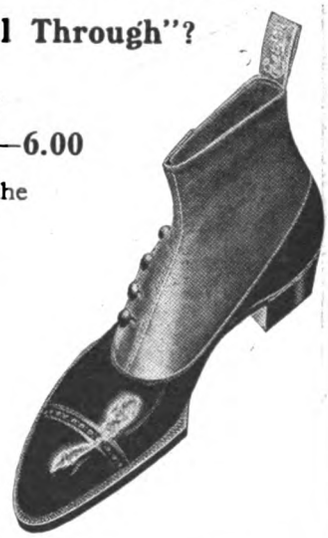

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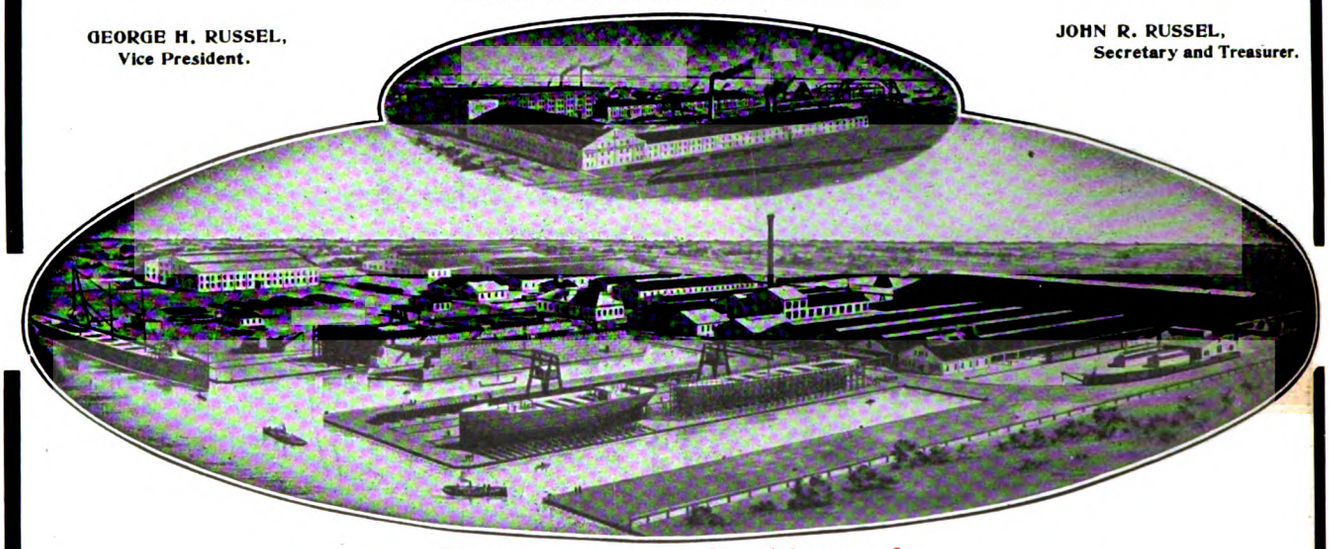

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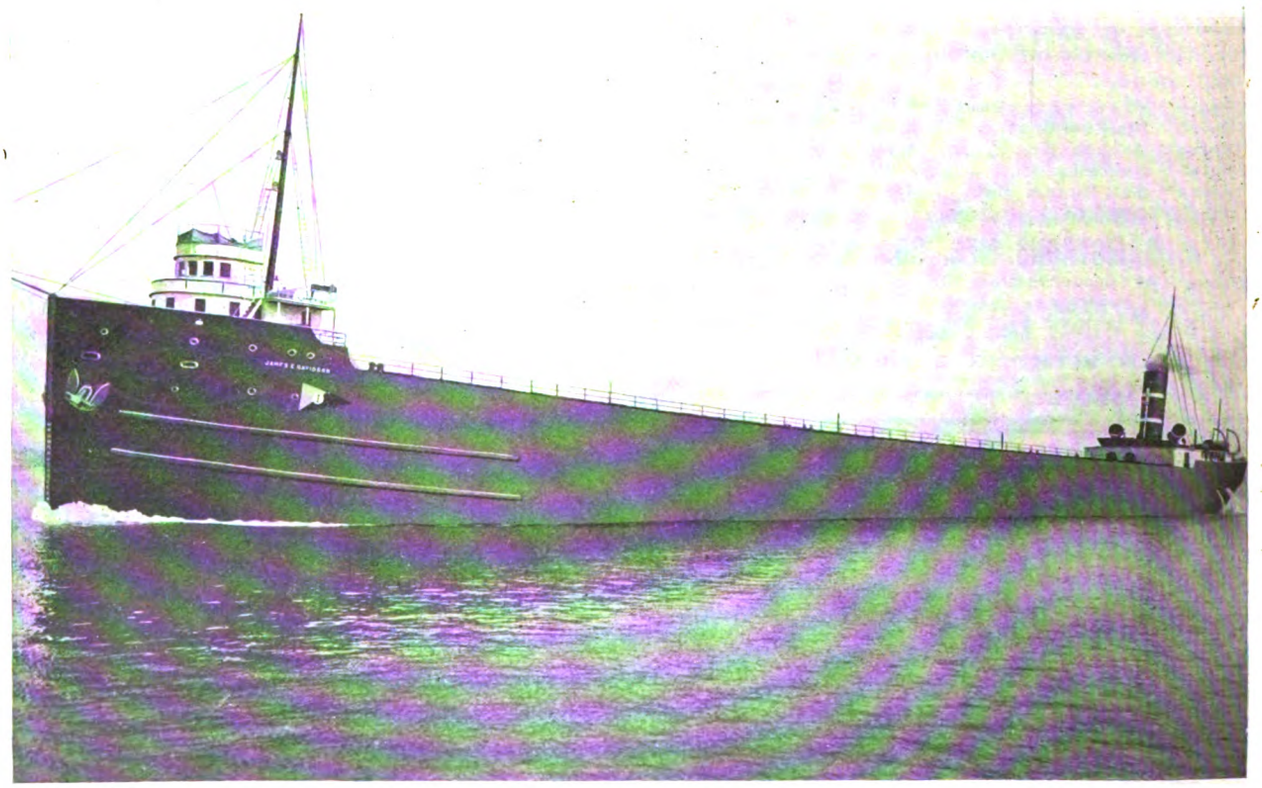

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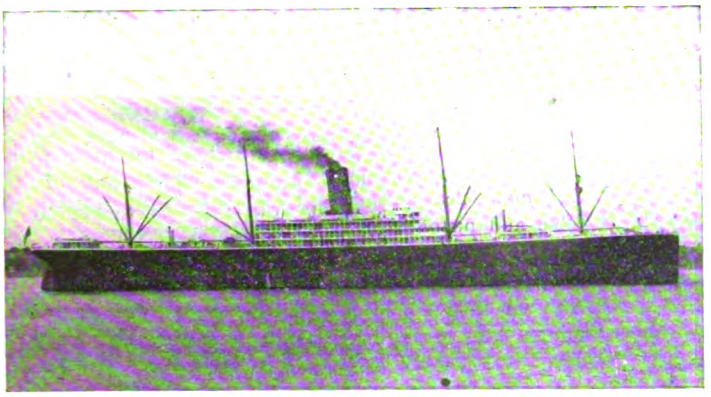

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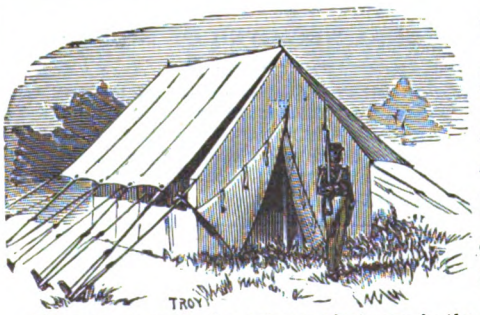

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1,000 h. p. fore and aft Neafie & Levy compound Engine; surface condenser; independent pumps.

Two 12-foot Scotch Boilers.

One 13½-foot Scotch Boiler.

One 10 16-25 x 16 triple expansion Engine.

Three 150-h. p. Almy Boilers.

One 200-h. p. Tregurtha Boiler.

One 14 30 x 24 fore and aft Engine and condenser.

One Williamson steering Engine.

One 10 k. w. electric lighting Set.

One 15 k. w. electric lighting Set.

One Providence Windlass, 50 fathoms 1½ in. chain.

Two thrust Shafts and Bearings, 8½ in. diameter.

MARVIN BRIGGS,
17 Battery place, New York, N. Y.

WANTED.—Tug; draft not over 3 ft. 6 in.; 30 to 40 H. P.; in good order, Sandusky Portland Cement Co., Sandusky, Ohio.

Steamer for Sale Cheap.

The lighthouse steamer Haze, 145 ft. long, 27-ft. beam, 9-ft. draught, 500 tons capacity, 300 horsepower engine and boiler, suitable for passenger or freight business, fully equipped. Steam capstan, donkey boiler. Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

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Insures against marine and inland transportation risk and will issue policies making loss payable in Europe and Oriental countries.

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During its existence the company has insured property to the value of	$21,108,343,494.00
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Issued certificates of profits to dealers	81,310,840.00
Of which there have been redeemed	73,744,440.00
Leaving outstanding at present time	7,566,400.00
Interest paid on certificates amounts to	19,469,981.85
On Dec. 31, 1905, the assets of the company amounted to	12,716,427.62

The profits of the company revert to the assured and are divided annually upon the premiums terminated during the year, thereby reducing the cost of insurance.

For such dividends, certificates are issued subject to dividends of interest until ordered to be redeemed, in accordance with the charter.

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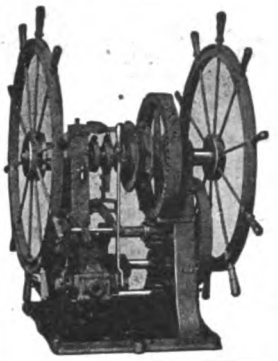

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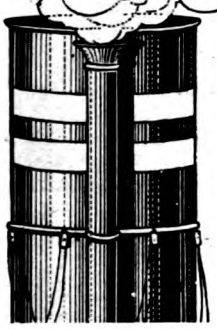

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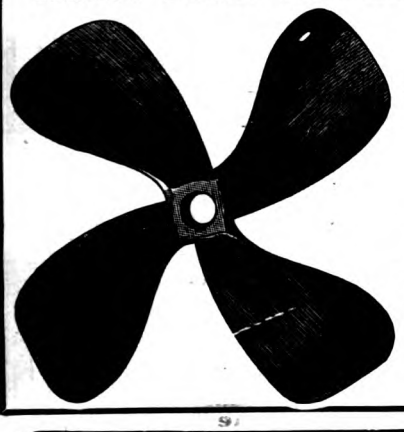

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Self-Igniting Inextinguishable

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NAMES OF CHARTS

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Lake Ontario
St. Lawrence River Nos. 1, 2, 3 4, 5, 6
Coast-Charts Nos. 1, 2, 3, 4, 5
Oswego Harbor
Little Sodus Bay
Great Sodus Bay
Charlotte Harbor
Niagara Falls

LAKE ERIE

Lake Erie
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7
Detroit River
Lake St. Clair
St. Clair River
Buffalo Harbor and Niagara River
Dunkirk Harbor
Erie Harbor and Presque Isle
Conneaut Harbor
Ashtabula Harbor
Fairport Harbor
Cleveland Harbor
Lorain Harbor
Huron Harbor
Sandusky Bay
Maumee Bay and Maumee River

LAKE HURON

Lake Huron and Georgian Bay
South End of Lake Huron
Saginaw Bay
Straits of Mackinac
Coast-Charts Nos. 5, 6, 7, 8
Sand Beach Harbor of Refuge
Saginaw River
Tawas Harbor
Thunder Bay
Presque Isle and Middle Island
St. Marys River Nos. 1, 2, 3
St. Joseph Channel and Western End of North Channel

LAKE MICHIGAN

Lake Michigan
North End of Lake Michigan
South End of Lake Michigan
Beaver Island Group
Grand and Little Traverse Bays
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9
South End of Green Bay
North End of Green Bay
Manistique Harbor
Charlevoix Harbor
South Fox Island Shoals
Manitou Passage
Frankfort Harbor
Manistee Harbor
Ludington Harbor
Muskegon Harbor
Harbor at Michigan City
Lake Front, Chicago
Milwaukee Harbor
Sheboygan Harbor
Manitowoc Harbor
Sturgeon Bay, Canal, and Harbor of Refuge
Head of Green Bay
Little Bay de Noc
Portage Lake, Manistee Co.

LAKE SUPERIOR

Lake Superior
Lake Superior Nos. 1, 2, 3
Coast-Charts Nos. 1, 6
Coast-Chart No. 8, including Isle Royal
Grand Island
Marquette and Presque Isle Harbors
Huron Bay and Huron Islands
L'Anse and Keweenaw Bay
Portage Lake and River
Copper Harbor
Agate Harbor
Eagle Harbor
Eagle River
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Apostle Islands Nos. 1, 2
Duluth and Superior Harbor
Agate and Burlington Bays (Two Harbors)

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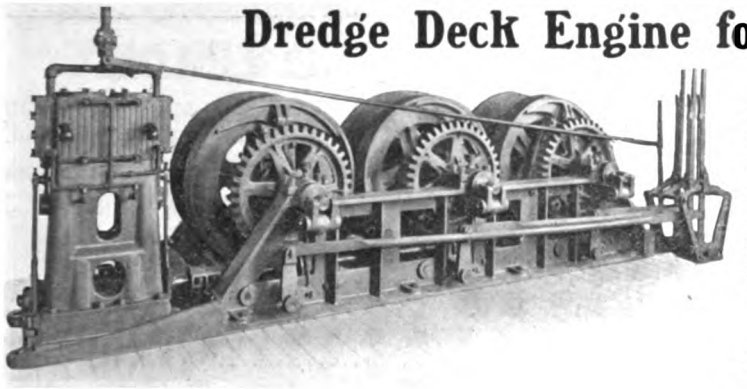
Dredge Deck Engine for Handling Dump Scows



Wire lines are used with this machine, instead of Manila, and we have the testimony of those using them, that they will **SAVE THEIR COST IN ONE SEASON.** Built in two sizes. (The cut shows small size.)

We also build **STEAM SCOW WINDERS** for raising the hopper doors by power. **WILL WIND UP A TEN HOPPER SCOW IN TEN MINUTES.**

Write for circulars and particulars.

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Simplest, Lightest, most Compact Boiler Made. can be cleaned and retubed without disturbing connections.

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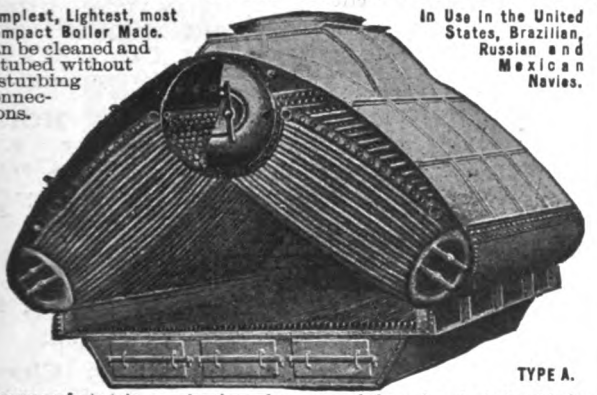

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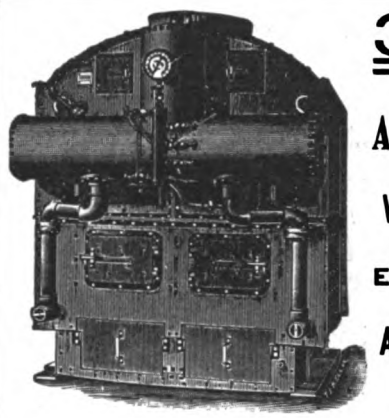
As many as forty tubes can be cleaned or renewed through a single hand-hole; has greater steam and water capacity than any other water tube boiler. Send for descriptive catalogue.

MOSHER WATER TUBE BOILER CO., NO. 1 BROADWAY, N. Y.



350 STEAM VESSELS

Now Equipped With

ALMY'S PATENT SECTIONAL Water Tube Boilers

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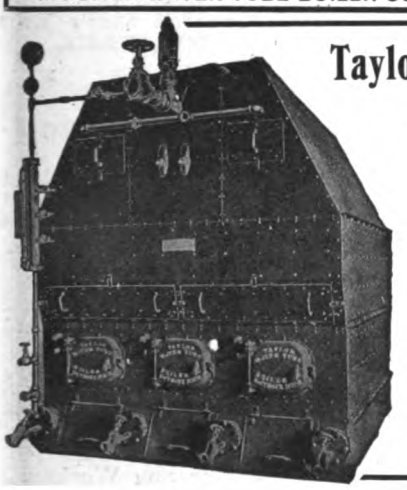
ALMY WATER-TUBE BOILER CO

PROVIDENCE, R. I.



Taylor Water Tube Boiler Co.

Vertical Tubes, sectional, large steam space and liberating area.
Fire box, combustion chamber, and course for the furnace gases similar to the Scotch Marine.
Free circulation type.

Send for full description.

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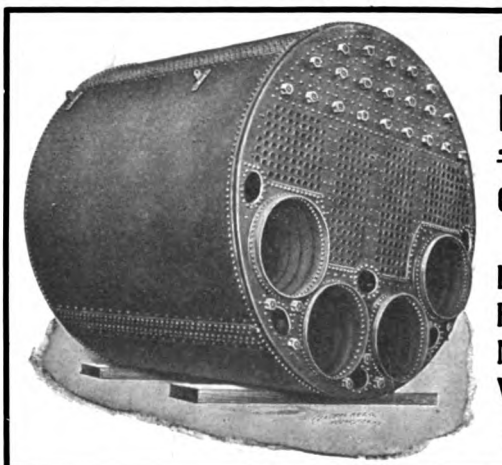

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OF ALL TYPES

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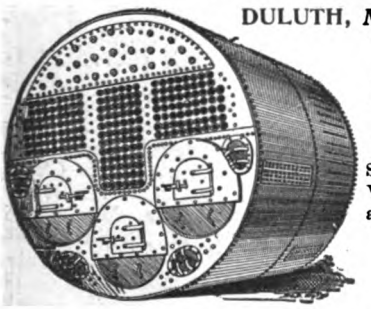

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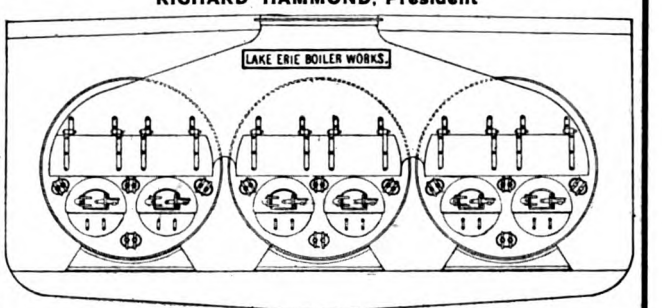

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For a more complete classification than that represented by advertisers in The Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, Marine and Naval Directory of the United States, published by The Marine Review, Cleveland.

[See accompanying Index of Advertisers for full addresses of concerns in this Directory.]

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Lake Erie Boiler Compound Co..... .....Buffalo
State Manufacturing Co...Cleveland.

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"The Peer of Boiler Cleansers"

TRADE METLA-COTA MARK

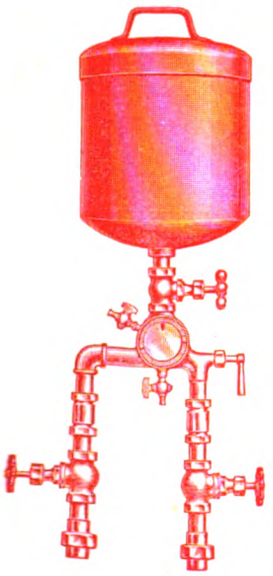
This preparation has met with wonderful success the past season in the Marine, Railroad and stationary boiler. MR. VESSEL OWNER, it will pay you to investigate our goods, and before laying up your boat for the winter, see that your boiler is treated with METLA-COTA.

It will certainly save many times its cost. Once tried you will continue to use it. Write for booklet with full information.

STATE MANUFACTURING CO.

Manufacturers of the celebrated METLA-COTA. 36 Michigan St., CLEVELAND, OHIO.

Red Star Boiler Compound



guaranteed to gradually remove old scale, prevent the formation of new, and to eradicate grease. It will not injure iron, brass, packing or any part of the steam plant. It is entirely free from strong acids and adulteration and will not contaminate live steam.

The secret of success with a good boiler compound is in properly feeding it into the boilers. The Red Star Automatic sight mixing compound feeder will feed one pint or one barrel per day as required. It is easily adjusted to any quantity to be fed and once properly set requires no further attention. Mixes compound with feed water in plain sight drop by drop, or in a steady stream as desired. It is made entirely of brass and cold drawn seamless steel and is light, durable and attractive.

Lake Erie Boiler Compound Co.

192-198 Chicago St., — BUFFALO, N. Y.

DEARBORN DRUG & CHEMICAL WORKS

WM. H. EDGAR, Founder

DEARBORN FEED-WATER TREATMENT

Made to suit the water as per analysis, used regularly, keeps boilers free from scale and prevents any corrosive action the boiler water may have on the iron.

Economy of operation is possible only with clean boilers.

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Hickler Bros. .....
.....Sault Ste. Marie, Mich.
Hubbell Co., H. W..Saginaw, Mich.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H...
....Milwaukee.
Sullivan, M.....Buffalo.

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Superior Iron Works...Superior, Wis.

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Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co.....
.... Detroit
Great Lakes Engineering Works....
.... Detroit.
Lockwood Mfg. Co.....
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Milwaukee Dry Dock Co.....
....Milwaukee.
Newport News Ship Building Co...
.....Newport News, Va.
Shipowners' Dry Dock Co.Chicago.
Superior Ship Building Co.....
.... Superior, Wis.
Tietjen & Lang Dry Dock Co.....
..... Hoboken, N. J.
Toledo Ship Building Co.....Toledo.

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Manitowoc Dry Dock Co.....
..... Manitowoc, Wis.

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Thropp & Sons, John E.....
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General Electric Co.....
.....Schenectady, N. Y.

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General Electric Co.....
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American Ship Building Co.....
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Briggs, Marvin.....New York.
Chicago Ship Building Co., Chicago.
Chase Machine Co.....Cleveland.
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New York Ship Building Co.....
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Sheriffs Mfg. Co.....Milwaukee.
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Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James ..... Cleveland.
Roelker, H. B.....New York.
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Lunkenheimer Co.....Cincinnati, O.

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.....Jersey City, N. J.

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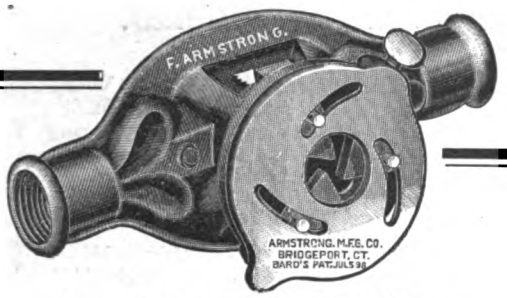

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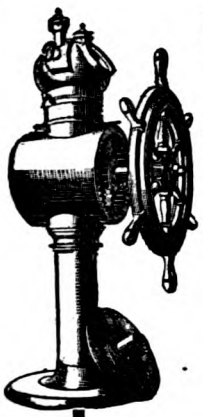

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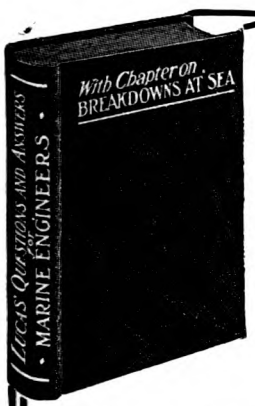

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Great Lakes Engineering Works.... Detroit.
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Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
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Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
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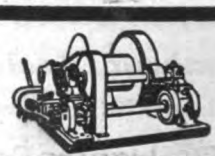

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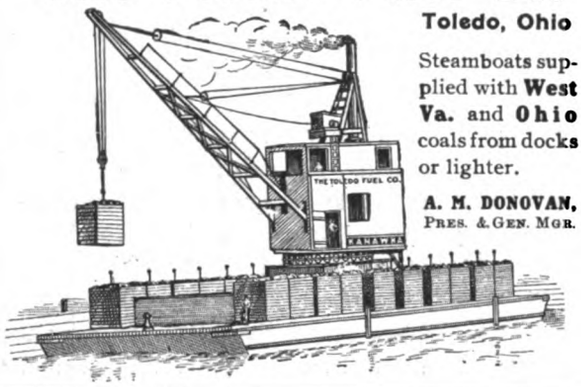

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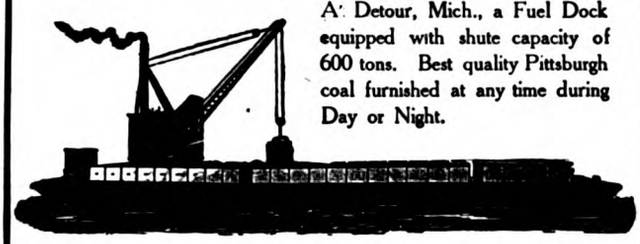

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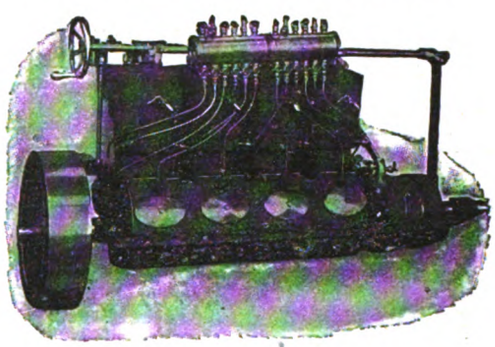

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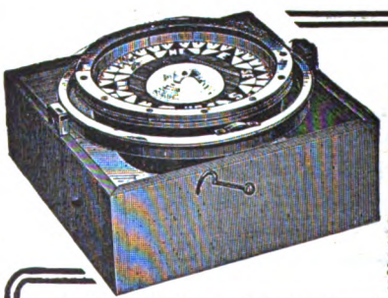

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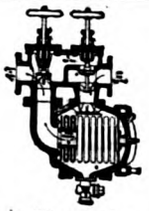

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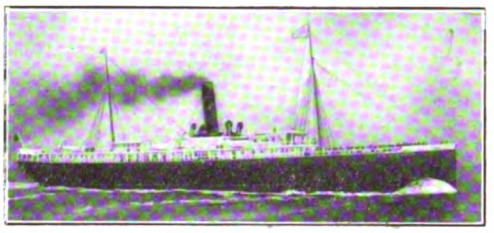

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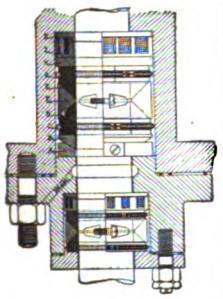

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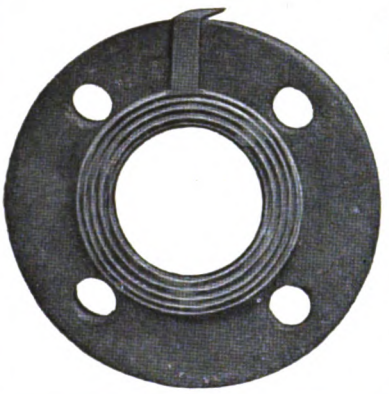

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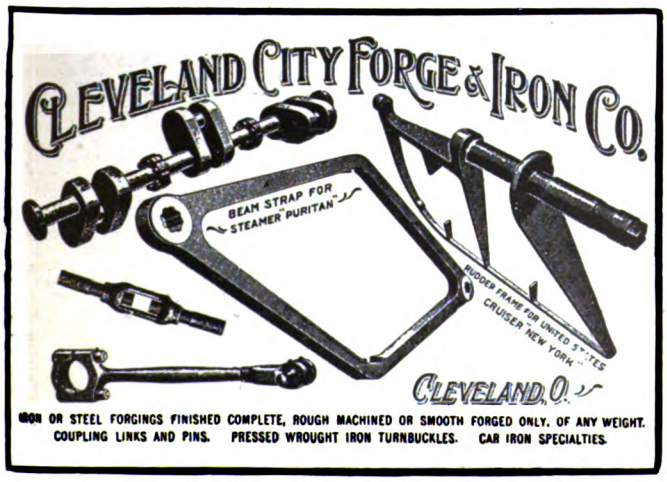
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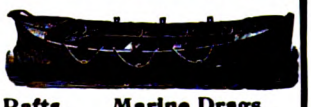

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